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SOUTH INDIAN OCEAN PILOT
FOR THE ISLANDS
WESTWARD OF LONGITUDE 80° EAST
INCLUDING MADAGASCAR
& THE COMORO ISLANDS.

THIRD EDITION, 1911.

CAUTION WHEN APPROACHING BRITISH PORTS.

(To be inserted inside cover of all Sailing Directions.)

PART I.—CLOSING OF PORTS.

(1) My Lords Commissioners of the Admiralty having taken into consideration the fact that it may be necessary to forbid all entrance to certain ports of the Empire, this is to give Notice that on approaching the shores of the United Kingdom, or any port of the British Empire, a sharp lookout should be kept for the signals described in the following paragraph, and for the vessels mentioned in paragraph (4), Part II., of this Notice, and the distinguishing and other signals made by them. In the event of such signals being displayed, the port should be approached with great caution, as it may be apprehended that obstructions may exist.

(2) If entrance to a port is prohibited, three *red* vertical lights by night, or three *red* vertical balls by day, will be exhibited in some conspicuous position in or near to its approach, which signals will also be shown by the vessels indicated in paragraph (4), Part II., of this Notice.

If these signals are displayed, vessels must either proceed to the position marked "Examination Anchorage" on the Admiralty Charts and anchor there, or keep the sea.

PART II.—EXAMINATION SERVICE.

(3) Under certain circumstances, it may become necessary to take special measures to examine vessels desiring to enter the ports or localities at home or abroad, referred to in Notices to Mariners No. 1 of 1916 and subsequent years.

(4) In such case, vessels carrying the distinguishing flags or lights mentioned in paragraph (6) will be charged with the duty of examining ships which desire to enter the ports and of allotting positions in which they shall anchor. If Government vessels, or vessels belonging to the local port authority, are found patrolling in the offing, merchant vessels are advised to communicate with such vessels with a view to obtaining information as to the course on which they should approach the Examination Anchorage. Such communication will not be necessary in cases where the pilot on board has already received this information from the local authorities.

(5) As the institution of the Examination Service at any port will never be publicly advertised, especial care should be taken in approaching the ports, by day or night, to keep a sharp lookout for any vessel carrying the flags or lights mentioned in paragraph (6), and to be ready to "bring to" at once when hailed by her or warned by the firing of a gun or sound rocket.

In entering by night serious delay and risk will be avoided if four efficient all round lamps, two *red* and two *white*, are kept available for use.

(6) By day the distinguishing flags of the Examination Steamer will be a special flag (white and red horizontal surrounded by a blue border) and a blue ensign.

Also, three *red* vertical balls if the port is closed.

By night the steamer will carry: (a) Three *red* vertical lights if the port is closed; (b) three *white* vertical lights if the port is open.

The above lights will be carried in addition to the ordinary navigation lights, and will show an unbroken light around the horizon.

(7) Masters are warned that, when approaching a British port where the Examination Service is in force, they must have the distinguishing signal of their vessel ready to hoist immediately the Examination Steamer makes the signal.

(8) Masters are warned that, before attempting to enter any of these ports when the Examination Service is in force, they must in their own interests strictly obey all instructions as to entry given to them by the Examination Steamer. In the absence of any instructions from the Examination Steamer they must proceed to the position marked "Examination Anchorage" on the Admiralty Charts, and anchor there, or keep the sea.

Whilst at anchor in the Examination Anchorage, Masters are warned that they must not lower any boats (except to avoid accident), communicate with the shore, work cables, move the ship, or permit anyone to leave the ship, without permission from the Examination Steamer.

(9) In case of fog, Masters of vessels are enjoined to use the utmost care, and the Examination Anchorage itself should be approached with caution.

(10) Merchant vessels when approaching British ports are specially cautioned against making use of private signals of any description, either by day or night: the use of them will render a vessel liable to be fired on.

(11) The pilots attached to the ports will be acquainted with the regulations to be followed.

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(To face Cautionary Notice in all Sailing Directions.)

NOTATIONS OF SUPPLEMENTS AND ANNUAL SUMMARIES OF NOTICES TO MARINERS RELATING TO THIS BOOK.

To be filled in by Navigating Officer.

[In Chart Dépôts the two first columns are alone to be filled up.]

Title.	Date of Publication and Number.	Whether pasted in or noted in Margins of Book, and Date of each Correction.



NOTICE.

HYDROGRAPHIC DEPARTMENT, ADMIRALTY.

In January of each year the information affecting this book, which has been published during the preceding year in the Admiralty Notices to Mariners, is compiled and issued as a separate publication. If a Supplement has been issued during the year, this publication will only include Notices issued since the date of the Supplement. Mariners are advised to procure copies of these publications. They can be obtained gratuitously from the Admiralty Agent or Sub-Agents for the sale of charts on presentation of the coupons on the next page, either personally or by letter. In the latter case the cost of postage must be enclosed.

The Supplements to this book which may be published can also be obtained in a similar manner on presentation of the coupons below.

H. E. P.-C.

Revised Supplement II. to

SOUTH INDIAN OCEAN

PILOT, 1911.

Revised Supplement to

SOUTH INDIAN OCEAN

PILOT, 1911.

Supplement to

SOUTH INDIAN OCEAN

PILOT, 1911.

NOTICE.

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The supplements to this book which may be published can also be obtained in a similar manner on presentation of the coupons below.

Supplement to	Revised Supplement to	Supplement to
South Indian Ocean	SOUTH INDIAN OCEAN	SOUTH INDIAN OCEAN
Part 1911	Part 1911	Part 1911

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during 1920, affecting

SOUTH INDIAN OCEAN PILOT, 1911.

Summary of Notices to Mariners published
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Summary of Notices to Mariners published

during 1950, affecting

South Indian Ocean Ports 1951

Summary of Notices to Mariners published

during 1949, affecting

South Indian Ocean Ports 1951

Summary of Notices to Mariners published

during 1948, affecting

South Indian Ocean Ports 1951

Summary of Notices to Mariners published

during 1947, affecting

South Indian Ocean Ports 1951

Summary of Notices to Mariners published

during 1946, affecting

South Indian Ocean Ports 1951

navigation

SOUTH INDIAN OCEAN PILOT,

FOR THE ISLANDS

WESTWARD OF LONGITUDE 80° EAST,

INCLUDING

MADAGASCAR AND THE COMORO ISLANDS.

ORIGINALLY COMPILED

BY

CAPTAIN H. A. MORIARTY R.N.

THIRD EDITION.



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ADVERTISEMENT.

This work contains sailing directions for Madagascar, Réunion, Glorioso, and other French possessions, dependencies of Madagascar, including the Comoro islands, which have been added to this edition. Also for Mauritius, and the several groups included in its government, viz., Rodriguez, Cargados Carajos, Tromelin, Agalega, Coetivy, and Chagos Archipelago with Diego Garcia. For Seychelles and the small island groups under its administration, viz., Amirante, Providence, St. Pierre, Farquhar, Cosmoledo, Astove, Assumption, Aldabra, and all adjacent islets. A description of Saya de Malha and Seychelles banks is also included, together with the islands of St. Paul and Amsterdam, and also the distant southern groups of Prince Edward or Marion islands, Crozet group, Kerguelen islands, Salamanca rocks, McDonald and Heard islands.

The directions for Madagascar, &c., were founded on the "Instructions Nautiques," No. 682, of 1885, and on Surveys conducted by Captain F. Moresby, R.N., 1821-2; Captain W. F. W. Owen, R.N., 1825. The other islands, including Mauritius, were surveyed by Captain R. Moresby, I.N., 1836-8; Captain Sir E. Belcher, R.N., 1846; Commander W. J. L. Wharton, R.N., 1874-8; Navigating Lieut. J. E. Coghlan, R.N., 1876-7; Commander P. Aldrich, R.N., 1881; Captain J. P. Maclear, R.N., 1882; Lieut.-Commander M. H. Smyth, R.N., 1892; and Commander H. T. B. Somerville, R.N., 1905.

Réunion island was chiefly derived from "Renseignements Nautiques sur quelques îles éparses l'Océan Indien Sud," and "Instructions Nautiques," No. 682, of 1885, published by the French Government.

The directions for Mauritius and Seychelles and the islands under their respective governments or administration, also the Southern islands, were compiled by Staff Commanders W. R. Martin, C. H. C. Langdon, and W. H. Petley, of the Hydrographic Department. These directions were embodied with those for Madagascar, by Captain H. A. Moriarty, R.N., C.B., after consulting former published works, the Remark Books of Her Majesty's ships, and all other available documents in the Hydrographic Department in January, 1891.

The description and illustrations of the West coast of Kerguelen are principally from information furnished by Commander T. Ring, of the Swedish Royal Naval Reserve.

The second edition was prepared by Captain E. H. Hills, R.N., much additional information, principally taken from "Instructions Nautiques," No. 842, of 1903, having become available since 1891, especially as regards Madagascar and its dependencies since the annexation of that island by the French Government.

This, the third edition, has been prepared by Commander W. O. Lyne, R.N., and contains the latest information, including the Comoro islands now added to the volume.

Officers of the Royal and Mercantile marine are requested to transmit to the Secretary of the Admiralty any notices of errors or omissions they may discover, as well as any fresh information they may obtain, in order that this work may be improved for the general benefit of the navigator.

By the publication of this work, the second edition, Supplement, 1908, and all Notices to Mariners referring to it, up to and including No. 1,654, of 1911, are cancelled.

H. E. P.-C.

*Hydrographic Office,
Admiralty, London,
20th December, 1911.*

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SYSTEM OF ORTHOGRAPHY.

Adopted by the Admiralty for Sailing Directions and Charts.

As far as has been found possible with existing knowledge, native names are spelt in accordance with the following system, which has been adopted by the principal authorities in Great Britain and by the United States, and has been for some years in process of gradual introduction into all Admiralty Sailing Directions and Charts.

No change is made in the orthography of foreign names in countries which use Roman letters; thus French, Spanish, Portuguese, Dutch, &c., names will be spelt as by the respective nations.

1. Where native names have been so long written in a form which, though not in accordance with this system, has become familiar to English eyes from being so spelt in all charts and maps, they are retained.

2. The true sound of the word as locally pronounced is taken as the basis of the spelling.

3. An approximation of the sound is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.

4. The broad features of the system adopted are that vowels are pronounced as in Italian and consonants as in English, *every letter being pronounced*. Two accents only are used:—

(1) The acute, to denote the syllable on which stress is laid. The use of this is very important, as the sounds of many names are entirely altered by the misplacement of this “stress.”

(2) The sign ~ over the letter U to denote the short sound of that vowel under certain circumstances. (See Table.)

5. When two vowels come together, each one is sounded, though the result, when spoken quickly, is sometimes scarcely to be distinguished from a single sound, as in *ai, au, ei*.

The amplification of the rules is given below.

Information is invited as to the proper spelling of native names, so as to produce the nearest approximation to the true sound, by this system.

Letters.	Pronunciation and Remarks.	Examples.
a	<i>ah</i> , a as in <i>father</i> - - - - -	Java, Banána, Somáli, Bari.
e	<i>eh</i> , e as in <i>bet</i> ; a as in <i>fate</i> - - - - -	Tel-el-Kebír, Oléleh, Yezo, Levúka, Peru.
i	English <i>e</i> ; i as in <i>ravine</i> ; the sound of <i>ee</i> in <i>beet</i> . Thus, not <i>Feejee</i> , but	Fiji, Hindi.
o	<i>o</i> as in <i>mote</i> - - - - -	Tokyo.
u	long <i>u</i> as in <i>flute</i> ; the sound of <i>oo</i> in <i>boot</i> . <i>oo</i> or <i>ou</i> should never be employed for this sound. Thus, not <i>Zooloo</i> or <i>Zoulou</i> , but	Zulu, Sumatra.

Letters.	Pronunciation and Remarks.	Examples.
	<p>The shorter sound of the different vowels, when necessary to be indicated, can be expressed by doubling the consonant that follows. The sounds referred to are as follows :—</p> <p>The short <i>a</i> as in <i>fatter</i>, as compared with the long <i>a</i> as in <i>father</i>.</p> <p>The short <i>e</i> as in <i>better</i>, as compared with the long <i>e</i> as in <i>me</i>.</p> <p>The short <i>i</i> as in <i>sinner</i>, as compared with the long <i>i</i> as in <i>wine</i>.</p> <p>The short <i>o</i> as in <i>sobbing</i>, as compared with the long <i>o</i> as in <i>sober</i>.</p> <p>The short <i>u</i> as in <i>rubber</i>, as compared with the long <i>u</i> as in <i>rubric</i>.</p>	Yarra, Tanna, Mecca, Jidda, Bonny.*
ü	<p>is the same short sound of <i>u</i> as is denoted by doubling the consonant following, but is used, and only used, where such doubling is impossible, as in the case of words where <i>u</i> is followed by two different consonants, as in <i>Tüng</i>, pronounced as the English <i>tongue</i>.</p> <p>Doubling of a vowel is only necessary where there is a distinct repetition of the single sound.</p>	Nuulúa, Oosima.
ai	English <i>i</i> as in <i>ice</i> - - - -	Shanghai.
au	<i>ow</i> as in <i>how</i> . Thus, not <i>Foochow</i> , but	Fuchau.
ao	is slightly different from <i>au</i> - - - -	Macao.
aw	when followed by a consonant or at the end of a word as in <i>law</i> - - - - thus	Cawnpore.
ei	is the sound of the two Italian vowels, but is frequently slurred over, when it is scarcely to be distinguished from <i>ey</i> in the English <i>they</i> , or <i>ei</i> in <i>eight</i> .	Beirút, Beilul.
b	English <i>b</i> .	
c	is always soft, but is so nearly the sound of <i>s</i> that it should be seldom used. If <i>Celébes</i> were not already recognised it would be written <i>Selébes</i> .	Celébes.
ch	is always soft as in <i>church</i> - - - -	Chingchin.
d	English <i>d</i> .	
f	English <i>f</i> . <i>Ph</i> should not be used for the sound of <i>f</i> . Thus, not <i>Haiphong</i> , but	Haifong, Nafa.
g	is always hard. (Soft <i>g</i> is given by <i>j</i>) -	Galápagos.
h	is always pronounced when used.	
hw	as in <i>what</i> ; better rendered by <i>hw</i> than <i>wh</i> , or <i>h</i> followed by a vowel. Thus, <i>Hwang ho</i> , not <i>Whang ho</i> or <i>Hoang ho</i> .	Hwang ho, Ngan hwei.
j	English <i>j</i> . <i>Dj</i> should never be put for this sound.	Japan, Jinchuen.

* The *y* is retained as a terminal in this word under Rule 1. The word is given as a familiar example of the alteration in sound caused by the second consonant.

Letters.	Pronunciation and Remarks.	Examples.
k	English <i>k</i> . It should always be put for the hard <i>c</i> . Thus, not <i>Corea</i> , but	Korea.
kh	The Oriental guttural - - - - -	Khan.
gh	is another guttural, as in the Turkish -	Dagh, Ghazi.
l	} As in English.	
m		
n		
ng		
	has two separate sounds, the one hard as in the English word <i>finger</i> , the other as in <i>singer</i> . As these two sounds are rarely employed in the same locality, no attempt is made to distinguish between them.	
p	As in English.	
ph	As in <i>loophole</i> - - - - -	Mokpho, Chemulpho.
th	stands both for its sound in <i>thing</i> , and as in <i>this</i> . The former is most common -	Bethlehem.
q	should never be employed; the sound of <i>qu</i> in <i>quiver</i> is given as <i>kw</i> . When <i>qu</i> has the sound of <i>k</i> , as in <i>quoit</i> , it should be given by <i>k</i> .	Kwangtung.
r	As in English.	
s	As in <i>sin</i> .	
sh	} As in English.	
t		
v		
w		
x	} is always a consonant, as in <i>yard</i> , and therefore should never be used as a terminal, <i>i</i> or <i>e</i> being substituted.	
y		Kikūyu.
	Thus, not <i>Mikindány</i> or <i>Wady</i> , but not <i>Kwaly</i> , but	Mikindáni, Wadi.
z	English <i>z</i> - - - - -	Kwale.
zh	French <i>j</i> , or as <i>s</i> in <i>treasure</i> - - -	Zulu.
	Accents should not generally be used, but where there is a very decided emphatic syllable or stress which affects the sound of the word, it should be marked by an <i>acute</i> accent.	Muzhdaha.
		Tongatábu,
		Galápagos,
		Paláwan,
		Saráwak.

In the case of native names in countries under the dominion of other European powers, in whose maps, charts, &c., the spelling is given according to the system adopted by that power, such orthography is, as a rule, disregarded, and the names are spelt according to the British system. Thus the island east of Java in possession of the Dutch is spelt *Madoera* by them, but on Admiralty charts *Madura*. A town in Java appears on Dutch charts as *Tjilatjap*; in the British, *Chilachap*.

When a foreign language is written in a vocabulary of fixed sounds, so as to permit of transliteration into the British system, a table of equivalents

for each letter is drawn up, and names of places can be transliterated without regard to pronunciation.

To reduce Greek names to the orthographic form, required by the foregoing system, would require so many changes that it has been decided to defer the revision of Admiralty publications until the system has been more generally introduced and used.

The Greek names are therefore left for the present in their old shape, but these give in most cases a very erroneous idea of the sound of the names, as pronounced by Greeks, and in many cases the modern Greek spelling gives a clue to the pronunciation by aid of the table of equivalents.

Thus Εὐβοία now spelt Eubœa is pronounced Evvia.

„ Χαλκίς „ Chalcis „ Khalkis.
 „ Κεφαλληνία „ Cephallonia „ Kefallinia.

Whenever C appears in a Greek name as at present written it may be taken for granted it has the sound of K.

Greek Letters	Roman Equivalents by Admiralty System	Greek Letters	Roman Equivalents by Admiralty System
Α α	a	Ρ ρ	r
Β β	v	Σ σ ς	s
Γ γ	g	Τ τ	t
Δ δ	d	Υ υ	i
Ε ε	e	Φ φ	ph
Ζ ζ	z	Χ χ	kh
Η η	i	Ψ ψ	ps
Θ θ	th	Ω ω	o
Ι ι	i	ΑΙ αι	ei
Κ κ	k	ΕΙ ει	i
Λ λ	l	ΟΙ οι	i
Μ μ	m	ΟΥ ου	u
Ν ν	n	ΥΙ υι	i
Ξ ξ	x	ΑΥ αυ	aph, av
Ο ο	o	ΕΥ ευ	eph, ev
Π π	p	ΗΥ ηυ	iph, iv

GLOSSARY OF THE MALAGASY LANGUAGE.

The following remarks, with a few words and sentences in common use,* are intended to assist a seaman in making himself understood by the natives, when lack of time and opportunity may prevent the study of the language thoroughly. The words selected from a Malagasy vocabulary will also assist the recognition of many of the names of places. Though some of the compound words are very long, the abundance of vowels renders them easily pronounceable when divided into syllables. As much of the spelling is phonetic, it is not always uniform in the same word. It appears desirable that the words which have been added to the Malagasy language from the English and French should be restored by future native scholars to their original shape and sound.

The orthography of this glossary, which is taken from works already published,* is not precisely the same as that of the system adopted by the Admiralty for geographical names. The principal differences are as follows:—letter *y* is used as a vowel, with a sound intermediate between a short Italian *e* and Italian *i*. The letter *o* is soft, being intermediate between a French *o* and an Italian *u*. Letter *i* after another vowel is always pronounced separately and plainly, with the sound of an Italian *i*.

The final letters, *ka*, *tra*, *na*, are scarcely sounded, and by some tribes they are quite silent. In forming compound words they omit or change the final letters, or even syllables, for euphony. If the first word terminates with *ka* or *tra*, and the second word commences with a consonant, those letters are omitted; if it ends in *na* the letter *m* is substituted, and the initial letter of the second word is changed, thus—*f* to *p*, *h* to *k*, *l* to *d*, *v* to *b*, *z* to *j*, *r* to *dr*, and *s* to *ts*; the other consonants are not changed. The same rule is followed after cutting off the final *y* from the preposition *any* (to the, &c.), which commences the names of many places. Example, instead of saying *any fasika mena* (at, to, or with the red sand), they say *Ampasimena*; instead of *any fasina fotsy* (at the white sand), they say *ampasimpotsy*. *Any hazo*

* Taken partly from a vocabulary written by three Malagasy gentlemen, edited by the Rev. W. Ellis, and printed by W. Stevens, for the London Missionary Society, 1863, also partly taken from the French "Instructions" No. 682, of 1885, and some nautical sentences kindly furnished by the Rev. George Cousins, of the London Missionary Society. See also a Malagasy-English dictionary by the Rev. J. Richardson, 1885.

be (to the great tree) becomes *ankazobe*; *any vato* (to the rock) becomes *ambato*; *any zozoro* (at the reeds) *anjozoro*; *any rahona fotsy* (the white clouds) *andrahampotsy*; *any saha kely* (at the rivulet) *antsahakely*. The final *y* is changed to *i* in the composition or uniting of words.

SOME GEOGRAPHICAL TERMS IN USE ON CHARTS AND IN SAILING DIRECTIONS OF MADAGASCAR.

Afiafi.—*Mangroves.*
Ambato.—*Rock.*
Ampanalana, Andilana.—*Isthmus.*
Ampasimena.—*Red sand.*
Aombi.—*Cattle.*
Bajina.—*Sand.*
Bé.—*Grand.*
Fasika, Fasina.—*Sand.*
Filao.—*Fish.*
Foti, Fotsi.—*White.*
Hoala, Horibé.—*Gulf.*
Keli.—*Little.*
Lakandrano.—*Canal.*
Lalana.—*Road.*
Lava.—*High, tall, long.*
Lovokeli.—*Cove.*
Mainti.—*Black.*
Mandri.—*Quiet.*
Mati.—*Dead.*
Mpanjaka.—*Chief.*
Nosi.—*Island.*
Ombi.—*Cattle.*
Oni.—*River.*

Orongia.—*Point of sand.*
Orontani.—*Peninsula, cape.*
Rati, Ratsi.—*Bad.*
Riaka.—*Sea.*
Rova.—*Fort.*
Soa.—*Good.*
Tafiana, Todiana.—*Anchorage.*
Tanana.—*Village.*
Tanga.—*Mangroves.*
Tani.—*Country, land.*
Tani Keli.—*Isthmus.*
Tani Mandrevo.—*Mud bank.*
Tanjona.—*Cape.*
Tendrona, Tsiraka.—*Point.*
Toliana, Tanambé.—*Town.*
Tondro.—*Finger.*
Valavo, Voalavo.—*Rat.*
Vao.—*New.*
Vato, Vatobé.—*Rock.*
Vatobé Andranomesina.—*Ledge of rocks.*
Vohitra.—*Mountain.*
Vori.—*Round.*
Vorona.—*Bird.*

SHORT SENTENCES.

Yes.—*Iny*. No.—*Tsia*.

Shipping, or, Ship.—*Sambo*.

Pilot.—*Mpitari-tsambo*, *Mpanamory sambo*.

Are you a pilot?—*Mpanamory sambo va hianao?*

I require a pilot.—*Mitady Mpanamory sambo aho*.

Show me the way.—*Tariho lalana aho*.

Show me the rocks.—*Lazas raha misy vatolampy*.

Take me into the river.—*Taniho hankamy ny ranirano aho*.

Bring me a surf boat.—*Ento ety ny botry*.

I require a guide.—*Mitady mpitaridalana aho*.

You shall be well paid.—*Homena vola be hianao*.

Has a ship been here?—*Moa misy sambo teto va?*

We saw a sail.—*Nahita sambo izahy*.

The canvas was torn.—*Triatra ny lain tsambo*.

Steam ship.—*Sambo setroka*.

Ship of war.—*Sambo miady*.

Merchant ship.—*Sambo mivanga* or *sambo mivarotra*.

Several ships arrived. — *Misy sambo maromaro tonga*.

When did they arrive?—*Oviana izy no tonga?*

A good ship.—*Sambo tsara*.

Have you seen a ship?—*Moa nahita sambo va hianao?*

Where are you bound?—*Ho aiza hianao?*

The ship was afloat.—*Mitsinkafona ny sambo*.

The cargo was destroyed.—*Ny entan tsambo simba avokoa*.

This ship belongs to that man.—*Ity sambo ity any io lehilahy io*.

You shall be my friend.—*Ho sakaizako hianao*.

You need not fear.—*Aza malahotra foana hianao*.

A fleet (many ships) entered the port.—*Sambo dia niditra aminy seranana*.

Good morning, good day.—*Finaritra anao, Akory anao* (a Sakalava salutation).

I want a horse.—*Izaho mila soavaly*.

Many horses.—*Soavaly maro*.

I am hungry.—*Noana aho, Izaho noana*.

I am very hungry.—*Noana dia noana aho*.

I am thirsty.—*Mangetaheta aho*.

Give me a drop of water.—*Omeo rano kely aho* (give water a little to me).

He and I are thirsty.—*Izy sy izaho mangetaheta*.

Give me something to eat.—*Omeo zavatra aho ho hanikio*.

Bring me some bread.—*Itondray mofo*.

Give me an egg.—*Omeo alody aho*.

Give me something to drink.—*Omeo zavatra aho ho sotroikio*.

Give us some water.—*Omeo rano izahay*.

The water is not clean.—*Tsi-madio ity rano ity*.

Take it away.—*Ento miala*.

Take it all away.—*Ento avokoa izy rehetra*.

Cut the meat.—*Didio ny hena*.

Eat the meat.—*Homana ny hena*.

I have plenty.—*Manana betsaka aho*.

We have plenty.—*Manana betsaka izahay*.

Eat rice.—*Hihinam-vary*.

Make a good fire.—*Manaova ofo tsara*.

Is the rice boiled?—*Masaka va ny vary?*

It is sour.—*Mahasikiry*.

It is not wholesome.—*Tsi-mahatsara*.

I am sorry for it.—*Malahelo aho amin-'izany*.

I eat.—*Izaho homana*.

We eat.—*Izahay homana*.

We drink.—*Izahay misotro*.

You drink.—*Ialahy misotro*.

Give it me.—*Omeo ahy*.

Give it us.—*Omeo anay*.

Give me another.—*Omeo ray hafa koa aho*.

Here it is.—*Inty eto*.

I like this.—*Ity no tiako*.

Give me a morsel of bread.—*Omeo sombi-mofo kely aho*.

Give me coffee.—*Omeo kafe*.

I salute you.—*Mihiarahaba, anao aho*.

I am glad.—*Faly aho*.

I am very glad.—*Fali-dia-faly aho*.

I am sorry.—*Malahelo aho*.

Stay a little.—*Mijanana kely*.

Sit down a little.—*Mipetraka kely*.

We will stay.—*Hijanona isikia*.

I am glad to see you.—*Faly aho mahita anao*.

My strength fails me.—*Beruko aho.*
 I am very unwell.—*Tsara hiany aho.*
 I am warm.—*Mafana aho.*
 I am cold.—*Mangatsiaka aho.*
 I am sick.—*Marary aho.*
 He is unwell.—*Marary izy.*
 We are sick.—*Marary izahay.*
 He is hurt or wounded.—*Naratra izy.*
 He is dead.—*Efa maty izy.*
 He killed himself.—*Namono-tena izy.*
 He died suddenly.—*Maty tampoka izy.*
 Bury the dead.—*Aleveno ny maty.*
 When shall we go?—*Ravoviana isikia no handeha?*
 Not yet.—*Tsy amboluna.*
 Are you in great haste?—*Maikia dia maikia hianso?*
 I will go.—*Izaho handeha.*
 I will not go.—*Izaho tsy handeha.*
 Let me go.—*Avelao aho handeha.*
 We go.—*Izahay handeha.*
 Let us go.—*Andeha isikia handeha.*
 Let them go.—*Avelao izy handeha.*
 You go.—*Ialahy mandeha.*
 Come back soon.—*Miverina haingana, or haingiana.*
 Good-bye.—*Veloma.*
 Wait for me.—*Andraso aho.*
 Do not wait for me.—*Aza miandry aho.*
 I will wait for you.—*Hiandry anao aho.*
 Carry that to my house.—*Ento any antranoko izy.*
 Do not waste time.—*Aza misakana ahy.*
 Do it well.—*Ataovy tsara.*
 Do it instantly.—*Ataovy ankehitriny izao.*
 Do not.—*Aza. Done.—Efa vita.*
 I shall not do that.—*Izaho tsy hanao izany.*
 Do it after.—*Ataovy rehefa.*
 Do as you please.—*Ataovy izay tianao.*
 Do it again.—*Ataovy indray.*
 I will get it done.—*Ataoko vita.*
 I did not do that.—*Izaho tsy nanao izany (I not do it).*
 You have done what I wished.—*Nataonao no tiako.*
 I wish it were finished.—*Sutrikio vita.*
 It is done.—*Efa vita.*
 Go and fetch that man.—*Andeha alao io lchilahy io.*
 Call him.—*Antsoy izy.*
 Did you call me?—*Niantso ahy va hianao?*
 What do you want?—*Inona no ilainao?*
 What do you call that?—*Inona no ataonao onarany io?*
 What is that?—*Koa inona izany?*
 How came you by it?—*Aiza no nahazoanao?*
 I cannot obtain it.—*Tsi-azoko.*

Where do you live?—*Aiza hianao no monina?*
 Come here, my friend.—*Avio eto ry sakaiza.*
 Come near the fire.—*Manatona ny afo.*
 This is the road.—*Ity no lalana.*
 Is the road good?—*Tsara va ny lalana?*
 Is the road bad?—*Ratsy va ny lalana?*
 It is sandy.—*Be fasikia.*
 The grass is very thick.—*Matevina dia matevina ny ahitra.*
 I am tired.—*Sasatra aho.*
 Which is the nearest way?—*Tza no akaiky indrindra?*
 It is too far.—*Lavitra loutra.*
 I will not go there.—*Izaho tsi-hankany.*
 Do not go to the left.—*Azo mandeka aminy ankavia.*
 Come with me.—*Avio hiarako amikio.*
 Come nearer.—*Avia akaiky kaiky kokoa.*
 I am coming.—*Ho avy aho.*
 They are coming.—*Ho avy izy.*
 Make haste.—*Fanangiana.*
 I am going home.—*Andeha hody aho.*
 Wait for me.—*Soavaly maro.*
 There it is.—*Indro eo.*
 Where has he gone?—*Lasa aiza izy?*
 Where are you going?—*Ho aiza hianao?*
 Go back again.—*Miverena indray.*
 I was never there.—*Tsy mba tany aho.*
 Are there rivers?—*Mba misy ony va?*
 The top of the mountain.—*Ny tampony ny tendrom-bohitra.*
 The dale is deep.—*Lalina ny loha-saha.*
 The ditch is deep.—*Lalina ny hady.*
 Not very far.—*Tsy lavitra loutra.*
 A good seaport town.—*Vohitra seranana tsara.*
 I do not believe it.—*Izaho tsy mino izany.*
 I believe it.—*Mino izany aho.*
 Take my word for it.—*Inoy ny filenikio.*
 Is that true?—*Marina va izany?*
 Are you sure of it?—*Marina va izany?*
 Yes, certainly.—*Eny tokoa.*
 It is certain.—*Marina tokoa va.*
 You are kind.—*Mora hianao.*
 You are idle.—*Malaina hianao.*
 What wages do you ask?—*Maninona no kerama ilainao?*
 How much?—*Hoatri-nona?*
 I agree to it.—*Ekeko izany.*
 Will you agree to it?—*Hanekiny izany va hianao?*
 It is agreed.—*Efa nifanaikena.*
 It was agreed.—*Efa nifanaiky.*
 I am neutral in their quarrel.—*Elanelany aho aminy adiny.*
 Answer me.—*Valio ny filenikio.*
 Speak to him.—*Mitenana aminy.*

Speak softly.—*Mitenana maleny.*
 Be silent.—*Mangina.*
 Begone with you.—*Mandehana hianao.*
 Do not approach me.—*Aza manatona ahy.*
 He is in great distress.—*Ory dia ory izy.*
 I distrust him.—*Tsy metoky azy aho.*
 I trust nobody.—*Tsy metoky na iza na aho.*
 He was frightened.—*Natahotra izy.*
 Who do you fear?—*Iza no atahoranao?*
 Do not dispute.—*Aza mifanditra.*
 Do not talk.—*Aza miresaka.*
 Have you lost anything?—*Very ravaatra va hianao?*
 What have you lost?—*Inona no anao very?*
 It is lost.—*Efa very.*
 It is not lost.—*Tsy very tsi akory.*
 Here it is.—*Ity eto; Ity eto.*
 The rice is here.—*Tonga ny vary.*
 Thank you.—*Veloma hianao.*
 What ails you?—*Inona no mankarary anao?*
 It is very hot.—*Mafana dia mafana.*
 Is that all?—*Izany hiany va?*
 I beg your pardon.—*Mifona aminao aho.*
 Is this your horse?—*Soraviliana va ity?*
 Let me have that horse.—*Avelao ho ahy io soralyio.*
 Why not?—*Nahoana?*
 I do not know.—*Izaho tsi mahalala; Tsy fantatra.*
 I know.—*Izaho mahalala.*
 You know.—*Hianao mahalala.*
 Improper.—*Tsi-mety.*
 Do not tell a lie.—*Aza milaza laingia.*
 Tell the truth.—*Ny marina lazarina.*
 I do tell the truth.—*Izaho milaza ny marina.*
 It is not so.—*Tsy izany tsi-akory.*
 It is not true.—*Tsi-marina izany.*
 It is a lie.—*Laingia izany.*
 You tell a lie.—*Milaza laingia hianao.*
 Are you sure of it?—*Mrinao va izany?*
 That is not right.—*Tsi-mety izany, tsi-marinaizany.*
 You are in the wrong.—*Diso hianao.*
 It is perfectly well.—*Tsara dia tsara.*
 I consent to it.—*Ekeko izany.*
 I consent heartily.—*Ekeko dia ekeko.*
 Let him do it.—*Avelo hato-any.*
 Let it be so.—*Aoko ho izany.*
 Why is it so?—*Nahoana no toizana?*
 I am against it.—*Tsy ekeko izany.*
 It is a trick.—*Fitaka izany.*
 I hate him.—*Tsi-tiako izany.*
 I will watch him.—*Izaho hiantandra izy.*
 He is an artful man.—*Lehilahy konjo izy.*
 A slothful man.—*Lehilahy kamo.*
 He is a wretched man.—*Olon dratsy izy.*

A man of valour.—*Lehilahy mahery.*
 A truthful man.—*Lehilahy marina.*
 He is tender hearted.—*Miantra izy.*
 A vehement man.—*Lehilahy masiaka.*
 He is a villain.—*Olon dratsy izy.*
 He is an unmerciful man.—*Lehilahy tsy miantra izy.*
 He has threatened us.—*Nandrahona anay izy.*
 He is yonder.—*Aroakotra izy.*
 His act was right.—*Tsara ny nataony.*
 He is asleep.—*Matory izy.*
 He is an assassin.—*Mpamono olona izy.*
 Do not assist him.—*Aza manonjy izy.*
 Bring him to me.—*Eto aty amikio izy.*
 He is a brute.—*Lehilahy ad ala izy.*
 He has great droves of cattle.—*Be omby izy.*
 His caution is great.—*Be ny fitandre-mamy.*
 He is cautious.—*Mitandrina izy.*
 What is his character?—*Manao ahoana ny fitondratamany?*
 He is a cheat.—*Mpanambaka izy.*
 He was condemned to death.—*No helohina ho faty izy.*
 He is an indolent fellow.—*Lehilahy malaina izy.*
 He is my comrade.—*Namakoi izy.*
 He is crazy.—*Andaladala izy.*
 He is a wag.—*Lehilahy ariravira izy.*
 He is an upright man.—*Lehilahy marina izy.*
 The thief has been discovered.—*Hitany mpangalatra.*
 He is displeased.—*Tezitra izy.*
 I warn you.—*Izaho mananatra anao.*
 He is a powerful man.—*Lehilahy mahery izy.*
 He is a robust man.—*Lehilahy matanjaka izy.*
 A man of fortune.—*Lehilahy be herena.*
 I am afraid of him.—*Matahotra azy aho.*
 It is nonsense.—*Tsinontsinona izany.*
 It is not likely.—*Tsi-tokony.*
 I am angry.—*Tezitra aho.*
 Keep your temper.—*Azo tezitra.*
 I will appease him.—*Hampianinikio izy.*
 I am inured to it.—*Zatra izany aho.*
 You are used to it.—*Zatra izany hianao.*
 It is my custom.—*Fanaoko.*
 According to custom.—*Takingy fanao.*
 It is contrary to custom.—*Tsy lahaky ny fanaoko.*
 He is mistaken.—*Diso izy.*
 You have been imposed upon.—*Vo' atitra hianao.*
 I trust to you.—*Hianao no itokinko.*
 Depend on my word.—*Matokia ny tenikio.*

Get away from here.—*Miala eto ; Miala hianao.*
 Step aside.—*Mita'nila.*
 Be still.—*Mangina.*
 Do not move.—*Aza mieroitra.*
 It is a slippery road.—*Lala-malala.*
 It is far from here.—*Lavitra raha eto.*
 He walks fast.—*Haingiam pandeha izy.*
 Take care.—*Tandremotsura.*
 Take care of the quagmire.—*Tandremo ny hona.*
 Do not stop.—*Aza miondrikia.*
 I will protect him.—*Ho arovuko izy.*
 I will protect you.—*Ho arovako hianao.*
 I am ready to fight.—*Efa ronona hiady aho.*
 They attacked us.—*Namely anay iza.*
 Depend upon me.—*Matokia ahy.*
 Is the road passable ?—*Azo aleha va ny lalana ?*
 I trust to you.—*Matoky anao aho.*
 You must do it.—*Tsy maintsy ataonao izany.*
 Be patient.—*Maharela.*
 He is patient.—*Maikia izy.*
 If you please.—*Raha sitra ponao.*
 I entreat you.—*Izaho mijona aminao.*
 It is so sometimes.—*Indraindray.*
 It is long since.—*Efa ela va izay.*
 A year hence.—*Raha efa ka iray taona.*
 In a short time.—*Vetivety foana.*
 After to-morrow.—*Rahafak'ampitso.*
 To-morrow morning.—*Ampitsomaraina.*
 Night comes on.—*Ho ariva ny andro.*
 It is very late.—*Alina dia alina.*
 Remember me.—*Tsarovy aho.*
 Remind him of it.—*Tsarovy aminy.*
 Forget it not.—*Aza hadinonina.*
 I forgot it.—*Hadinoko.*
 As (or whatever) you please.—*Izay tianao.*
 If you will.—*Raha tianao.*
 What is that good for ?—*Inona no mahatsara izany ?*
 What is meant ?—*Inona no heviny ?*
 It is wholesome food.—*Hanina mahatsara.*
 Take some.—*Mitondra.*
 I do not like it.—*Tsi-tiaka ; Izaho tsi-tia.*
 I like it very much.—*Tiaka dia tiaka. Tsara dia tsara.*
 The wasp stung me.—*No kekeringy lanenitra aho.*
 What do you want ?—*Inona no ilainao ?*
 Who is there ?—*Iza izao ?*
 What is that ?—*Inona izany ? Inona io inona izany ?*
 Whose is that ?—*Anizo io ?*
 It is yours.—*Anao.*
 It is not mine.—*Tsy ahy.*

It is his.—*Azy.*
 You took it.—*Nentinao.*
 Take it away.—*Ento mialo.*
 He has committed a theft.—*Nangalatra izy.*
 I am vexed with you.—*Sasotra aminao aho.*
 I have no suspicion.—*Izaho tsi-manana ahiahy.*
 I have discovered all.—*Hitako avokoa.*
 They have made friends.—*Afa nisakaizy izy.*
 He (or she) is proud.—*Miavonavona izy.*
 He is sullen.—*Nimonjononjo izy.*
 I sent him some money.—*Nampana terikiovola izy.*
 I complain to you.—*Izaho mitaraina-aminao.*
 Unloose him (let him go).—*Vahao izy.*
 Suppose I go.—*Raha nandeha aho.*
 He is unable to go.—*Tsi-afaka mandeha izy.*
 He will not go.—*Tsi-mety mandeha izy.*
 It is uncertain.—*Tsi-fantatra loatra.*
 Do not loiter.—*Aza mijanonjanona.*
 I fell down.—*Potraka aho.*
 Rest awhile.—*Mijanona kely kely.*
 I am very tired.—*Sasatra dia sesatra aho.*
 Run at full speed.—*Mihazakazaha fain-giana.*
 I will go home by-and-bye.—*Hody aho rehefa efa.*
 Come along with me.—*Avia hiaraka amikio.*
 A boisterous sea.—*Ranomiasina mahery.*
 The sea is calm.—*Malemy ny ranomasina.*
 Salt the fish.—*Asio fanasina ny hazandrano.*
 Dry the clothes.—*Ahazonny lobaka.*
 Bring your brother.—*Ento ny rahalahinao.*
 Bring him home.—*Ento mody izy.*
 Let him help.—*Avelao izy hamonjy.*
 Call your companions.—*Antsoy ny namanao.*
 Sit down.—*Mipetraka.*
 Give me good advice.—*Ameo-anatra tsara aho.*
 Let us pass.—*Andeha isikina handalo.*
 Let them pass.—*Avelaho izy handalo.*
 What shall we do ?—*Inono no hataonay ?*
 What will you do ?—*Inono no hataonao ?*
 It is done.—*Efa vita.*
 Go and do it again.—*Andeha ataovy indray.*
 I cannot do it.—*Tsi-azoko atao.*
 Sing a song.—*Mihira.*
 Bring me some water.—*Itonbray rano izahay.*

- Does the water boil ?—*Mangotraka va ny rano ?*
 Why do you bring me brackish water ?—*Naohano hianao no milondra rano masirasira ?*
 I take what I please.—*Entikio izaytiako.*
 Come near me.—*Avio eto akaikaiky.*
 Bring your friend.—*Ento ny sakaizanao.*
 He drew back.—*Nihemotra izy.*
 He ran away.—*Nandonitra izy.*
 I am willing to go.—*Ta-handeha aho.*
 Buy something.—*Mividianana zaratra.*
 Buy some powder.—*Mividia vanja.*
 What do you choose ?—*Inona no tianao ?*
 Choose those you please.—*Fidio izany tianao.*
 Try that.—*Andramo io.*
 I will try that.—*Handramako io.*
 Who will give ?—*Iza no hanome ?*
 I will buy some hides.—*Izaho hividy hoditra.*
 Give me some chalk.—*Omeo taniravo aho.*
 Make a sweet cake.—*Manaova va ampem-pamamy.*
 Bake some bread.—*Mahandroa mofo.*
 Give me a piece of cloth.—*Omeo lamba aho.*
 Give me some fine calico.—*Omeo somizy aho.*
 It is not sufficient.—*Tsi-ampy.*
 Less than half.—*Tsi-ampy an-tsasany.*
 We are even.—*Sahala tsikia.*
 That is sure, or true.—*Marina izany.*
 That is greater.—*Io lehihebe kolaho.*
 That is the best.—*Io natsara indrindra.*
 It is too short.—*Fohy loatra.*
 It is too dear.—*Sarotra loatra.*
 I am counting.—*Manisa aho.*
 There is enough for ten persons.—*Ampy olona fola.*
 It is large.—*Lehibe.*
 It is sufficient.—*Antoniny.*
 Very good.—*Tsara dia tsara.*
 Very bad.—*Ratsy dia ratsy.*
 It is not clean.—*Tsi-medio.*
 A white cloth.—*Lamba fotsy.*
 A dirty cloth.—*Lamba maloto.*
 A striped cloth.—*Lamba misoratsoko ratra.*
 A large house.—*Trano lehibe.*
 A fine house.—*Trano tsara.*
 A small house.—*Soavaly kely.*
 Soft wood.—*Teny malemy.*
 New bread.—*Mofo vaovao.*
 A heavy load.—*Entana mave-atra.*
 A long cane.—*Tsontsonraka lava.*
 A gold box.—*Vata vola-mena.*
 Too fat.—*Matany loatra.*
 Too lean.—*Mahia loatra.*
 A fat duck.—*Vorom-bazaha matavy.*
 This duck is too lean.—*Ity vorom-bazaha ity mahia loatra.*
 This goose is very fat.—*Ity vorom-be ity matavy dia matavy.*
 A sharp knife.—*Antsy marinitra.*
 Looking glass.—*Fiteratra.*
 A kind man.—*Lehilahy mora.*
 A wise man.—*Lehilahy hendry.*
 A strong slave.—*Andevo matanjaka.*
 Strong of body.—*Matanjaka.*
 He is in the right.—*Marina ny azy.*
 He is very clever.—*Hendry dia hendry izy.*
 I love you.—*Tiako hianao.*
 I bought some bullocks.—*Nividy omby aho.*
 A bullock was killed.—*Omby no vonono.*
 It is too tough.—*Maosatra loatra.*
 It is not wholesome.—*Tsi-mahatsara.*
 It is eatable.—*Fihinana va.*
 It is dirty.—*Maloto.*
 It is very clean.—*Madio dia madio.*
 It is too large.—*Lehebe loatra.*
 It is too small.—*Kely loatra.*
 That is too little.—*Kely loatra izany.*
 That is too much.—*Be loatra izany.*
 It is too heavy.—*Mavesatra loatra.*
 It is too light.—*Maivana loatra.*
 It is too dear.—*Sesotra loatra izany.*
 It is not dear.—*Tsy sarotra tsi-akory.*
 It is very cheap.—*Mora dia mora.*
 That is not good.—*Tsy tsara izany.*
 You ask too much.—*Hianao mila be loatra.*
 It is in pieces (broken).—*Vakivaky.*
 It is enough.—*Antoniny izany.*
 It is not enough.—*Tsa empy.*
 That is the best.—*Io no tsara in drindra.*
 It is too thin.—*Manify loatra.*
 It is too thick.—*Mativina loatra.*
 Here is your money.—*Indro ny volanao.*
 Is that all ?—*Izany hiany va ?*
 It is right.—*Marina va.*
 Right hand.—*Ny tanana ankavanana.*
 Left hand.—*Ny tanana ankavia.*
 I have.—*Izaho manana.*
 Thou hast.—*Ialahy manana.*
 He has.—*Izy manana.*
 We have.—*Izahay manana.*
 You have.—*Hianao manana.*
 They have.—*Izy manana.*
 I had.—*Izaho manana.*
 Thou hadst.—*Ialahy manana.*
 He had.—*Izy manana.*
 We had.—*Izahay manana.*
 You had.—*Hianao manana.*
 They had.—*Izy manana.*
 I have had.—*Izaho efa manana.*
 Thou hast had.—*Ialahy efa manana.*
 He has had.—*Izy efa manana.*
 We have had.—*Izahay efa manana.*

You have had.—*Hianao efa manana.*
 They have had.—*Izy efa manana.*
 Shall I have?—*Hanana va aho?*
 Wilt thou have?—*Hanana va ialahy?*
 Will he have?—*Hanana va izy?*
 Shall we have?—*Hanana va irikia?*
 Will you have?—*Hanana va hianao?*
 Will they have?—*Hanana va izy?*

I did not play.—*Izaho tsy nilaolao.*
 Thou didst not.—*Ialahy tsy.*
 He did not.—*Izy tsy.*
 We did not.—*Izahay tsy.*
 You did not.—*Hianao tsy.*
 They did not.—*Izy tsy.*
 I will not do.—*Tsy mety.*

NUMERALS.

The Arabic figures being common to both languages.

1.—*Tsa; Raiky; Iray.*
 2.—*Roa; Roy.*
 3.—*Telo; Mamoko.*
 4.—*Efatra.*
 5.—*Dimy; Limy.*
 6.—*Enina; Tsioto.*
 7.—*Filo.*
 8.—*Valo.*
 9.—*Sivy.*
 10.—*Folo.*
 11.—*Iraik' amby ny folo.*
 12.—*Roa amby ny folo.*
 13.—*Telo amby ny folo.*

Similar combinations to twenty.

20.—*Roa-polo.*
 21.—*Iraik' amby roa-polo, &c.*
 30.—*Telo-polo.*
 40.—*Efa-polo.*
 50.—*Dimam-polo.*
 60.—*Enim-polo.*
 70.—*Filo-polo.*
 80.—*Valo-polo.*
 90.—*Sivi-folo.*
 100.—*Zato.*
 200.—*Ronn-jato.*
 1,000.—*Arivo.*
 10,000.—*Iray alina.*
 1,000,000.—*Tapitr-isa.*

PRINCIPAL POINTS OF THE COMPASS.

North.—*Avaratra, or Avatra.*
 North-east.—*Avaratr' atsinanana.*
 East.—*Atsinanana.*
 South-east.—*Atsimo-atsinanana; Anjoro-nakoho.*

South.—*A-tsimo.*
 South-west.—*A-tsimo-andrefana.*
 West.—*Andrefana.*
 North-west.—*Avaratr' andrefana.*

WIND (or rainy wind).—*Rivotra.*

Dry wind.—*Rivomaina; Rivomaika.*
 Wind from west (on the west coast).—*Talia.*
 Wind from south (on the west coast).—*Animbakala.*
 Wind from north (on the west coast).—*Varatrazo; Avaraka.*

Wind from the sea (Sea breeze).—*Tafidrano; Rivodrano-masina.*
 The wind is variable.—*Tsi-miova ny rivotra.*
 It blows hard.—*Mandivatra.*
 A gentle zephyr.—*Rivotra andrefana.*

THE TIDES.—*Ny dia ny ranomasina.*

High tide.—*Ranosorona; Ranofeno.*
 Low tide.—*Ranohaka; Ranomasika.*
 Ebb tide.—*Rano mody; Ranomandia; Ranomizotso; Ranomidina.*
 Rising tide.—*Miakatra ny rano.*
 The commencement of spring tides.—*Ranovakiloha.*

Spring tides.—*Samontabe.*
 Spring tide at full moon.—*Samontao ny antorony; Samonta ny haboriany.*
 The tides at new moon.—*Samonta ny ivakiany; Samonta ny ankidiny.*
 Neap tides.—*Rano gegy.*

MONTHS.

January.—*Alalamady*.
 February.—*Adaoro*.
 March.—*Adizaaza*.
 April.—*Asorotany*.
 May.—*Alahasaty*.
 June.—*Asambola*.

July.—*Andimizana*.
 August.—*Alakarabo* ; *Anarambolana*.
 September.—*Alakaosy*.
 October.—*Adijady*.
 November.—*Adalo*.
 December.—*Alohotsy*.

WEEK DAYS.

Sunday.—*Alahady*.
 Monday.—*Alatsinainy*, *tinainy*.
 Tuesday.—*Talata*.
 Wednesday.—*Alarobia*.

Thursday.—*Alakamisy*.
 Friday.—*Zoma*.
 Saturday.—*Asabotsy*.

MONEY.—*Vola*.

A dollar or five francs.—*Farantsa* ;
Parata ; *Ariary*.
 $\frac{1}{2}$.—*Loso*.
 $\frac{1}{4}$.—*Kirobo*.

$\frac{1}{8}$.—*Sikajy*.
 $\frac{1}{16}$.—*Lasiray*.
 $\frac{3}{4}$.—*Voamena*.
 $\frac{1}{4}$.—*Eranambatry*.

A SELECTION OF WORDS IN COMMON USE.

Able.—*Mahavita* ; *Mahay*.
 Abode, habitation, dwelling.—*T'onenana*,
fitoerana.
 Above.—*Ambony* ; *Ambonibony*, *ka*
miavatra.
 About.—*Manodidina*, *tokony*.
 Abundant, Abundantly.—*Betsaka*.
 Accept.—*Mandray aministrapo*.
 Acceptable.—*Mankasitraka* ; *Mahafin-*
aritra.
 Acclivity.—*Fiakarana*.
 Accompany.—*Miaraka*.
 Acid, sour.—*Maharikivy*.
 Across (ad).—*Mitsivalana*.
 Actively.—*Mazoto* ; *Mailaka*.
 Admiral.—*Mpijehy ny sambo* *ny*
mpanjaka.
 Advice (s).—*Anatra*.
 After (p).—*Manaraka* ; *Manenjikia*
ariana ; *Rehefa*.
 Afterwards (ad).—*Manarakaraka* ; *Re-*
hefa atohoato.
 Again (ad).—*Indray*.
 Agree (a).—*Mailaka* ; *Avanavanana*.
Mavio.

Agree (vn).—*Mana eiky* ; *Mifanaraka*.
 Agreed (a).—*Ikena* ; *Raikitra*.
 Aid (s).—*Famonjena mamonjy*. Aid him.
Vonjezo izy.
 Alive (a).—*Velona*, *tey maty*.
 All (a).—*Rehetra*.
 Alligator (s).—*Vay*.
 Allow (v a).—*Maneky* ; *Avela* ; *anao* ;
Mameka.
 Alone (a).—*Erery* ; *Tokana*.
 Altogether (ad).—*Dahaolo*.
 Always (ad).—*Mandrakariva*.
 Ambush (s).—*Fanotrehana*.
 Amiable (a).—*Mailaka* ; *Avanavanana*.
 Ammunition (s).—*Zavatra fiadiana*.
 An (art).—*Anankiray*.
 Ancestor (s).—*Razana*.
 Anchor (s).—*Vato fantsikia*.
 Anchorage (s).—*Ny tany fandatsahan-*
bato-fantsikia.
 And (conj).—*Ary* ; *Sy*.
 Animal (s).—*Biby*.
 „ large.—*Biby lehibe*.
 Annual (a).—*Ary isantaona*.
 Another (a).—*Ny hafa*.

- Answer (s).—*Valinteny*.
 Antiquity (s).—*Taloha, ela*.
 Any (a).—*Niza niza ; Izay misy*.
 Apartment (s).—*Efi-trano*.
 Ape (s).—*Antima*.
 Approach (v a).—*Manatona*.
 Arms (s).—*Fiadiana*.
 Army (s).—*Betsaka ; Miaramila*.
 Arrack (s).—*Barankay*.
 Artizan (s).—*Mpanao zavatra*.
 As (conj).—*Toy ; Tahaka ; Raha*.
 Asleep (a).—*Matory*.
 Ass (s).—*Ampondra*.
 Assassin (s).—*Mpamono olona*.
 Assist (v a).—*Mamonjy ; Mampandroso*.
 Assistant (s).—*Mpanampy*.
 At (prep).—*As ; Es ; Any ; Amy*.
 Await (v n).—*Miandry ; Manantena*.
 Awake (v n).—*Mahatsiara ; Mamoha*.
- Baboon (s).—*Antima lehibe*.
 Bad (a).—*Ratsy ; Raty*.
 Bait (s).—*Jono ; Fintana*.
 Bake (v a).—*Manendy ; Mahandro*.
 Bamboo (s).—*Volotsangana ; Vola ; Valiha ; Volotara*.
 Banana (s).—*Akondro*.
 Barter (v n).—*Mifanakalo*.
 Basket (s).—*Horona ; Soliky*. A large basket.—*Sobiky lehibe*.
 Bat (s).—*Manavibe*.
 Bath (s).—*Fandroana*.
 Bathe (v a).—*Mandro ; Misasa ; Milomano*.
 Bay (s).—*Mivovo ; Mena ; Hory ; Lovoka*. A large open bay.—*Hoala*.
 Beach (s).—*Morondrano*.
 Bead (s), glass bead.—*Hangy*.
 Bearer (s).—*Mpitondrazavatra*.
 Beast (s).—*Biby*.
 Bed, or channel of a river.—*Masondrano ; Masonony*.
 Bedstraw (s).—*Lafi-pandriana*.
 Bee (s).—*Renintately*.
 Beef (s).—*Hena*.
 Before (ad).—*Taloha ; Fony ; Aloha*.
 Beforehand (ad).—*Rahateo ; Taloha*.
 Befriend (v a).—*Misakiza*.
 Beg (v a).—*Mangataka ; Miangavy*.
 Beggar (s).—*Mpanataka*.
 Begin (v n).—*Vao mitchina ; Manantatraso*.
 Begone.—*Mandehana ; Miala*.
- Behave.—*Mitondratena*. If you behave well.—*Raha mahay mitondratena hianao*.
 Behind.—*Ivoho ; Es voho*.
 Be it so.—*Oka ary ; Ho izany anie*.
 Believe.—*Mino*.
 Belong.—*Mamba ; Azy ; Anjarary*.
 Better.—*Tsaratsara ; Kokoa*.
 Beyond.—*Andafy*.
 Big.—*Bé*.
 Bird.—*Vorona*.
 Black.—*Mainity*.
 Blind.—*Jamba*.
 Blood.—*Ra*.
 Bloodthirsty.—*Tahandatsadraha*.
 Bloody.—*Misa ra*.
 Blue.—*Manga*.
 Boar.—*Lambo*.
 Boat.—*Lakana*.
 „ balanced (Madras boat).—*Lakampiana*.
 Body.—*Tena ; Olona ; Vatana*.
 Bog.—*Hona*.
 Bird.—*Mitsimoka ; Maniry ; Vorona*.
 Boil (v).—*Mafana ; Mangotraka*.
 Boisterous (a).—*Mifotofoto ; Loza ; Mafy*. A boisterous sea.—*Ranomamasina mahery*.
 Bottle.—*Tavoahangy ; Folapay ; Folakoho*.
 Brackish.—*Masirasira*.
 Brave.—*Mahery ; Matoky*.
 Breeze (of wind).—*Tsioka ; Rivotra ; Tafiotra*.
 Bridge.—*Tetezana*.
 Briar or thorn.—*Roy ; Roitra*.
 Bring (v a).—*Maka ; Mitondra ; Miteraka ; Mahalanga ; Mampiditra ; Mitarikia*.
 Bone.—*Taolana*.
 Buffalo (and cattle generally).—*Omby*.
 Bug.—*Kongono*.
 Bullet.—*Bala*.
 Bullock.—*Ombalahy ; Omba*.
 Bullrush.—*Zozora*.
 Buoy.—*Zavatra mitsinkiafona*.
 But (conj.).—*Fa ; Afatsy ; Kanafa ; Sangy ; Noho*.
 Buy (v).—*Mividy*.
 By (prep.).—*Amy ; Amelany*.
 By-and-bye.—*Refeha ; Aloato*.
- Cabbage.—*Leison*.
 Cabin.—*Trano-kely ; Efi-trano*.
 Cable.—*Mahazaka lehibe*. The ship's cable.—*Ny mahazakan tsambo*.

- Cake (s).—*Ampempa*.
 Calabash or pumpkin.—*Siny*; *Voatavo*.
 Calf.—*Zanak omby*.
 Calico.—*Hariry*; *Lamba fotsy*.
 Calm (a).—*Mionina*; *Mianina*.
 Cambric.—*Hariry madinikia*; *Somizy*.
 Camel.—*Angamenavava*.
 Camp (s) Mil.—*Toby*; *Lasy*.
 Can (can do).—*Mahay*; *Mahazo*. Can
 you do it?—*Azoao atao va?*
 Canal.—*Lakandrano*.
 Cannon.—*Tafondro*.
 Canoe.—*Lakana*.
 Canvas.—*Lamba fanaolain-tsambo*.
 Cape.—*Orantany*; *Tanjona*.
 Capital (chief town).—*Reni-vohitra*.
 Captive.—*Babo*; *Sambotra*; *Fisamborambabo*.
 Captor.—*Mpamabo*; *Mpisambotra*.
 Carcass.—*Faty*; *Efa lo*.
 Careful (a).—*Milandrina*; *Miahiahy*.
 Careless.—*Tsy milandrina*.
 Cargo.—*Entana*. The ship's cargo.—*Ny entan-tsambo*.
 Carrier, porter.—*Mpitondra*; *Maro mila*; *Mpilango*; *Mpitakona*.
 Carry (v).—*Mitondra*.
 Cartridge box.—*Kotra*.
 Cascade, or torrent.—*Riana*.
 Cash.—*Vola*. Your money.—*Volanao*.
 Cask.—*Barikia*.
 Cataract.—*Hantsanaian-jarany rano*.
 Cave, cavern.—*Lavaka*; *Zohy*.
 Caution.—*Fitandremana*.
 Cautious. — *Milandrina*; *Miambina*; *Miaro*.
 Cease (v n).—*Mijanona*; *Mitsahatra*.
 Centipede.—*Trembo*.
 Centre.—*Ny afovoany*.
 Certain (a).—*Marina*; *Anankiray*; *Tokoa*; *Tsimaity*.
 Certainly.—*Marina*; *Tokoa*; *Izany tokoa*.
 Chain.—*Masomby*; *Mifanohy*; *Tongalikia*; *Gadra*; *Rojo*.
 Chair.—*Sezo*.
 Chalk.—*Taniravo*.
 Change.—*Ovana*; *Soloana*. Do not change.—*Aza tsy ovana*.
 Changeable.—*Azo ovana*; *Miova*.
 Chapel.—*Tranofivavahana*.
 Chaplain.—*Mpitory teny*.
 Character.—*Fitondrantena*; *Marikia*; *Soratra*; *Fanahy*.
 Charcoal.—*Arina*.
 Chase (v a).—*Mihaza*; *Miremby*; *Manenjikia*.
 Cheap.—*Mora vidy*.
 Cheaply.—*Mora*.
 Cheat (v).—*Fitaka*; *Soloky*; *Fanam-bakana*.
 Cheater (s).—*Mpamitaka*; *Mpanambaka*.
 Cheerful (a).—*Ravo*; *Fuly*.
 Cheese.—*Forimazy*.
 Chicken.—*Akoho kely*.
 Chief (of a village on the west coast).—*Masondrano*.
 Chieftain.—*Mpifehy*; *Lohany*.
 Child.—*Ankizi-miadinikia*; *Anaka*.
 Childless.—*Momba*.
 Chimney.—*Fivavahan-tsetroka*.
 Chisel.—*Fandrafa*.
 Choice.—*Fidy*; *Safidy*; *Fidina*.
 Choose.—*Mifidy*; *Mifantina*.
 Church.—*Trano-fivavahana*.
 Circle.—*Vorivory*; *Boribory*.
 Citadel.—*Trano fivarovana*.
 Citron.—*Tsoha*; *Voavary*.
 City.—*Ranivohitra*; *Renitanana*.
 Civility.—*Haia*.
 Claim.—*Maka*; *Manao hoe ahy*. I claim it as my own.—*Alaikio ho ahy*.
 Clay.—*Tanimora*; *Tanimanga*.
 Clean.—*Madio*; *Malio*.
 Clear, bright, light.—*Mazava*.
 Clergy.—*Mpixavaka*; *Mpitory teny*.
 Clerk.—*Mpanoratra*; *Raharaha*. He is my clerk.—*Mpanoratro izy*.
 Cliff.—*Morotsangana*.
 Cloth or clothes.—*Lamba*; *Akanjo*.
 Coal.—*Arin-tany*.
 Coconut and tree.—*Voaniho*.
 Coffee.—*Kofe*.
 Coffin.—*Vata ritoerana ny maty*.
 Coin.—*Vola*.
 Cold.—*Mangatsiaka*; *Tsitia*.
 Colleague.—*Manana*.
 Combat.—*Ady*; *Combitant*; *Mpiady*.
 Come.—*Avy-tonga*.
 Coming.—*Ho avy*; *Ho tonga*.
 Comfortable.—*Mahafinaritra*.
 Commander, or Commodore.—*Mpifehy*.
 Commerce.—*Varotra*; *Fivarotana*.
 Commercial.—*Mandranto*.
 Comrade.—*Namana*; *Sakaiza*.
 Condemn.—*Manazy*; *Maniny*; *Man-datsa*; *Manameloaka*.
 Conduct.—*Fitondran-tena*.
 Conductor.—*Mpitarikia*; *Impitaridana*.
 Confide.—*Matoky*.
 Consul.—*Mpanapaka*; *Maso-voho*; *Mpitsara ny vahiny*; *Mpandranto*.
 Cool.—*Manara*.
 Copper.—*Varahina*; *Saba*.
 Correct (a).—*Raikitra*; *Marina*.

Cost.—*Vidiny*; *Mason-karena*. How much did it cost?—*Maninona ny vidiny*?

Costly (It is costly).—*Saro-bidy*.

Cottage.—*Trano madinikia*.

Cotton.—*Landahazo*; *Landihazo*.

Covetous.—*Mahihitra*; *Maniry*; *Tia*; *Mila*.

Council, assembly, or business.—*Kahaby*; *Kahary*.

Count (v a).—*Manisa*.

Country.—*Tany*.

Couple (s).—*Roa*; *Mivady*.

Courier.—*Iraka*.

Coward.—*Osa*.

Crab, or crayfish.—*Foza*.

Craft (a vessel).—*Lahasa*; *Fitaka, sambo kely*.

Creek.—*Fiolehana, amoron-dranomasina*; *Lovokely*; *Vavarano kely*.

Crew (of a ship).—*Oloni miangona*; *Nymatilo aminy sambo*.

Criminal, culpable or crooked.—*Meloka*.

Crocodile.—*Voay*; *Mamba*.

Customhouse.—*Ladoany trano fandra isam panisananana*.

Cut (v).—*Mandidy*.

Dark.—*Maizina*.

Daughter.—*Zanavary*.

Dawn.—*Manzava-ratsy*.

Day.—*Andro*.

Daybreak (cock-crowing). — *Maneno akoho*; *Anto-Andro*.

Dead (a).—*Maty*.

Dear (costly).—*Sarotra*.

Debt.—*Trosa*.

Deceit or deception.—*Fitaka*; *Soloky*.

Decency.—*Onony*; *Ny marina*.

Deck (of a ship).—*Toko-tanin-tsambo*.

Deep.—*Lalina*; *Lavitra*; *Voly*.

Depth.—*Halalina*.

Defy (v a).—*Mihakia*; *Maninana*.

Delicious.—*Fy*.

Delight.—*Mahafinaritra*.

Detestable.—*Hala*; *Lavina*; *Tsitiana*.

Dew.—*Vonotra*; *Ando*.

Dexterous.—*Avana-vanana*.

Diamond.—*Vato-soa*.

Direction (to a place).—*Fanoroana*; *Teny*; *Lalana*; *Filazana*.

Dirty.—*Maloto*; *Vetaveta*.

Disagreeable.—*Mahadikidiky*; *Ratsy*; *Tsi-mifanaraka*.

Dish.—*Vilia*.

Dislike.—*Tsi-tia*.

Distant.—*Lavitra*; *Ela*.

Distress.—*Loza*; *Fahoriana ory*.

Distrust.—*Tsy matoky*.

Dive (v n).—*Misitrika*. Can you dive? — *Mahay misitrika va hianao*?

Do (v a).—*Manao*; *Mahefa*.

Doctor.—*Mpanao fanafody*.

Dog.—*Amboa*; *Alika*.

Domestic (a s).—*Mpisa rivy*.

Door.—*Varavarana*.

Dove or pigeon.—*Voro-mailala*.

Drink.—*Zavatra sotroina*.

Drunk.—*Leon-toaka*; *Mano*; *Mamono foaka efa nisotro*.

Dry.—*Maika*; *Maïna*.

Duck (s).—*Vorom-bazaha*; *Drakidraki*.

Eagle.—*Voro-mahery*.

Earth.—*Tany*.

Earthquake.—*Horohoron-tany*.

Easily.—*Mora*; *Tsi-sarotra*.

Easy.—*Mora*; *Miandana*.

East (v n).—*Homana*.

Eatable.—*Fihinanana*.

Ebony.—*Volom-bolimpona*.

Eel.—*Manindao*.

Empty.—*Foana*; *Lany*; *Na inona-tsi misy*.

Enemy.—*Fahavalo*.

Enormous.—*Meloka*; *Loza lehibe*; *Ratsy*.

Enough.—*Ampy be-tsaka*.

Enter (v).—*Miditra*.

Entrance.—*Fidirana*; *Voalohany*.

“ to a river or bay. — *Vinany*.

Equal.—*Mitovy*; *Sahala*.

Escape.—*Mandositra*.

Escort.—*Miambina*.

European.—*Vazaha*.

Even (a).—*Marina*; *Mitovi-rano*.

Evening.—*Hariva*.

Ever.—*Naovina-naovina*; *Mandrakizay*.

Every.—*Tsi-rairay*; *Avokoa samy*.

Every day.—*Isan-andro*.

Except (prep).—*Afa-tsy, raha-tsy*.

Exchange.—*Manakalo*.

Eye.—*Maso*.

Fact.—*Ny atao marina*; *Ny izy*.

False.—*Tsy marina*; *Laingia*.

Family.—*Mpianakavy*.

- Far.—*Lavitra*.
 Farewell.—*Veloma* ; *Masina*.
 Farther.—*Lavidavitra kokou*.
 Fat.—*Matavy*.
 Father.—*Ray*.
 Feathers.—*Volo*.
 Female—Feminine.—*Vary*.
 Fetch (v a).—*Maka* ; *Mahazo*.
 Fever.—*Tazo*.
 Few.—*Vitsy*.
 Field.—*Saha*.
 Field-piece.—*Tafondro* ; *Madinikia*.
 Fig.—*Voara* ; *Aviavy*.
 Finger.—*Tondro*.
 Fire.—*Afo*.
 Firearms.—*Basy*.
 Fish.—*Hozan-drano* ; *Laoka* ; *Filao* ;
 Fia.
 Fish-hook.—*Fintana*.
 Flag.—*Faneva* ; *Saina*.
 Flannel.—*Bodo-fotsy*.
 Flat.—*Lampy*.
 Fleet (s).—*Sambo iray dia*.
 Fleet (a).—*Malady* ; *Mailuku*.
 Flint (for musket).—*Afo-vuto*.
 Flour.—*Mafarina* ; *Koba*.
 Fool, foolish.—*Adala* ; *Adaladala*.
 Foot.—*Tongotra* ; *Tomboka*.
 Ford (across a river).—*Fitsuhana* ;
 Filahana.
 Forefather.—*Razana*.
 Foreigner, or stranger.—*Vahiny*.
 Forest.—*Ala*.
 Forgotten.—*Hadino*.
 Forgive.—*Mamela heloka*.
 Fort.—*Manda* ; *Rova* ; *Roho*.
 Forward (a d).—*Aloha*.
 Fowl.—*Akoho*.
 Freight.—*Tambi-tsambo*.
 Fresh (new).—*Vaovao*.
 Friend.—*Havava* ; *Sakaiza*.
 Frigate.—*Sambo lehibe*. (Large ship).
 From (prep).—*Avy aminy*.
 Fruit.—*Voan-kazo*.
 Fuel.—*Kitay*.
 Full.—*Feno*.
 Full-moon.—*Fano ny volana Fenom-*
 anana.
 Further.—*Lavidavitra*.
 Future.—*Ny ho-avy*.

 Gale.—*Rivotra*.
 Garlic.—*Tongolo*.
 Gently (a d).—*Mora* ; *Miadana*.
 Give (v).—*Manome*.
 Goat.—*Bengy* ; *Ozy*.

 Go (v).—*Mandeha*.
 God.—*Andriamanitra*.
 Gold.—*Volamena*.
 Good.—*Tsara* ; *Maeva* ; *Senga* ; *Soa*.
 Goose.—*Vorom be*.
 Grapes.—*Voaloboka*.
 Grass.—*Ahitra* ; *Bozaka*.
 Gravel.—*Kirao-bato* ; *Kiafia* ; *Fasibe*.
 Gray.—*Fitahana*.
 Great (a).—*Lehibe*. A great man.—
 Lahilahy lehibe.
 Green.—*Maitso*.
 Grotto.—*Zohy*.
 Ground.—*Tany*.
 Guide.—*Mpitarialanila*.
 Gulf.—*Hoala* ; *Hoiibe*.
 Gum.—*Akanjo-nify* ; *Ditin-kiazo*.
 Gum-copal.—*Sandatrotsy*.
 Gun shot.—*Tra-basy*.

 Hair.—*Volo*.
 Hammer.—*Tantanana*.
 Hand.—*Tanana*.
 Harbour.—*Fitodinan-tsambo* ; *Fialofana* ;
 Seranana ; *Todiana*.
 Harbour or anchorage.—*Tafana*.
 Hasten.—*Ha/aisingiana*.
 Hawk.—*Papango*.
 He (pro).—*Izy*.
 Head.—*Loha*.
 Healthy.—*Finaritra* ; *Tsi-farofy*.
 Heaven.—*Lanitra*.
 Heavy.—*Maveatra*.
 Hedge.—*Fefy*.
 Hedgehog.—*Tandraka*.
 Height.—*Favavony*.
 Help (v a).—*Manonjy*.
 Helpless.—*Tsi-manan-kamonjy*.
 Hen.—*Akoho vavy*.
 Here.—*Eto* ; *Aty*.
 Heron.—*Vano* ; *Langoro*.
 Hide (v a).—*Manafina*.
 Hide (s).—*Hoditra*.
 High (a).—*Avo* ; *Ambony luvi*.
 ,, (standing up).—*Taangana*.
 High tide.—*Alaotra*.
 Hill.—*Tendrombohitra* ; *Bongokely* ; *Ki-*
 borintany ; *Zanabongo*.
 Hill (small hill).—*Vohitra kely*.
 Hilly.—*Be-havoana*.
 Him.—*Azy* ; *Izy*.
 Himself.—*Izy*.
 His.—*Ny azy*.
 Hold.—*Hazonina*.
 Holiday.—*Andro masina* ; *Andro fadina*

Home.—*An-tanon-tena*.
 Honest.—*Marina*, *tsy mamitaka*.
 Honey.—*Tantely*.
 Hook.—*Parango*.
 Horn.—*Tandroka*.
 Horrible.—*Loza*; *Ratsy*; *Mahatahotra*.
 Horse.—*Soavaly*.
 Hot (a).—*Mafana*; *May*.
 House.—*Trano*.
 Hungry.—*Noana*.
 Husband.—*Vady*; *valy*.
 Hurricane.—*Rivotra mahery*.
 Hurry.—*Maikia*.
 Hurtful.—*Maharatsy*.
 Hut.—*Trano kely*.

I (pro).—*Izaho*.
 Idiot.—*Adala*.
 Idle.—*Malaina*.
 Idol.—*Sampy*.
 If (conj).—*Raha*.
 Image.—*Sary*; *Sampy*.
 Improper.—*Tsi-mety*; *Tsi-mendrikia*.
 Impure.—*Maloto*.
 In (prep).—*Any anatiny*; *Ao*; *Aminy onby eo*.
 Incomplete.—*Tsi-tanteruka*.
 Indigo.—*Aikia*.
 Indolent.—*Mailiana*; *Kano*.
 Infamous.—*Ratsy indrindra*.
 Inland.—*Tanety lavitriny ny anomasina*.
 Inlet of the sea.—*Aleha*; *Fidirana*.
 Innocent.—*Madio*; *Mahitsy*.
 Insect.—*Voana*.
 Inside.—*Ny anatiny*.
 Insist.—*Mitoetra*; *Tsi-mova*.
 Insolent.—*Valavala*; *Miaronaivona*.
 Interpret.—*Milaza ny heviny mandikianteny*.
 Into (prep).—*Ao*; *Any*; *Ho any*.
 Intoxicate.—*Mankaleo*.
 Intrigue.—*Tetikia*; *Fitaka*.
 Iron.—*Vy*.
 Is.—*No*; *Hisy*; *Misy*.
 Isle, Island.—*Nosin tany*.
 Isthmus.—*Tany kely*; *An-dilana Ampanalana*.
 It (pron).—*Izy*; *Ny*; *Iz-any*.
 Itself.—*Tena*; *Vatan-tena*.

Jew.—*Vakinorano*.
 Journey.—*Nidia*; *Ny aleha*; *Lalana*.

Joy.—*Fahafaliana*.
 Joyous.—*Faly*; *Mirana*; *Raro*.
 Judge.—*Adriam-baventy*.
 Just, or Justly.—*Marina*.
 Justice.—*Fahamarinana*.

Keel.—*Vodi-sambo*.
 Keep.—*Mitahiry*; *Mitana*.
 Keg.—*Barikia kely*.
 Kill.—*Mamono*; *Vono*.
 King.—*Mpanjaka-lahy*.
 Kite (a bird).—*Papango*.
 Knife.—*Antsy*.
 Known (part).—*Fantatra*.

Labourer.—*Mpiasa*.
 Lad (boy).—*Zaza-lahy*.
 Lading.—*Entana*.
 Lady.—*Rafotsy*; *Tompoko-vavy*.
 Lagoon.—*Tampolo*.
 Lake.—*Galona*; *Kofehy*; *Farihy*. Small lake.—*Kamory*.
 Lame.—*Mandriangia*.
 Lamp.—*Jilo*; *Favilo*; *Finala*.
 Lance.—*Lefona*; *Sabaha*; *Sulohy*.
 Land.—*Tany*; *Firenena*.
 Landlord.—*Tompo ny Tany*.
 Lane.—*Lalan' ety*.
 Large.—*Lehibe*; *Bé*.
 Laugh.—*Mihomehy*.
 Launch.—*Miely*; *Mandeha*.
 Lead (s).—*Firaka*; *Milari-dalana*.
 Leader.—*Mpitarikia lehibe*.
 Leak.—*Loaka*; *Milete*.
 Lean.—*Miankina*; *Mahia*.
 Leather.—*Hoditra*.
 Left (to the left).—*Ankavia*.
 Leg.—*Ranjo*.
 Lift (v a).—*Mambata*; *Munangana*; *Areina*.
 Like.—*Tahaka*; *Tiana*.
 Line.—*Tsipikia*; *Kofehy*; *Favitra*.
 Linen.—*Hariry*; *Lamba atao aminy rongony*.
 Little (in size).—*Kely*. (In quantity).—*Masay*.
 Living.—*Fivelomana*; *Velona*.
 Lizard.—*Androngo*.
 Loadstone, magnet.—*Andriam-by*.

Lobster.—*Orana* ; *Fihinana* .
 Locust.—*Valala*.
 Long.—*Lava* ; *Ela*.
 Loose (let go).—*Mamaha* ; *Mahafaka*.
 Loser (s).—*Ny resy*.
 Love and loving.—*Tia*.
 Lovely.—*Tsara* ; *Mampahatia*.
 Low.—*Ambany* ; *Voly* ; *Vody*.
 Luggage.—*Entana*.

 Mahogany.—*Nanto* ; *Nulo*.
 Mainmast.—*Andri-beu-tsambo*.
 Male.—*Lahy*.
 Man.—*Lahilahy* ; *Olona*.
 Mangrove.—*Tanga* ; *Honko* ; *Afiaty*.
 Manly.—*Matoky* ; *Tsy osa*.
 Map.—*Sarin Tany*.
 Market.—*Tsena*.
 Marriage.—*Fanam-badiana*.
 Marsh.—*Hona* ; *Heniheny*.
 Marshmallow.—*Fiandri-lavenona*.
 Mat.—*Tsihy*.
 Mate.—*Namana*.
 Me (pro).—*Izaho* ; *Ahy*.
 Measure.—*Ohatra* ; *Fanoharano* ; *Fetra* ;
 Famaran-javatra ; *Faritra*.
 Meat.—*Hena*.
 Mediate (v a).—*Mifona* ; *Manelanelana*.
 Medicine.—*Ody* ; *Fanafofy*.
 Melon.—*Voan-tango*.
 Mend (v a).—*Mamboatra* ; *Manatsara*.
 Menial (s).—*Manompo*.
 Merchandise.—*Varotra* ; *Jerikia*.
 Merchant.—*Mpandranto* ; *Mpivarotra*
 Mpivange.
 Mercy.—*Indra-fo* ; *Fiantrana*.
 Merry.—*Ravo* ; *Faly* ; *Falifaly*.
 Messenger.—*Iraka*.
 Middle. — *Afovoany* ; *Tenatenany* ;
 Elanelany.
 Midday.—*Mitataovovonana*.
 Midnight.—*Mamaton-alina*.
 Midsummer.—*Aty-fahavaratra*.
 Milk.—*Rorono* ; *Ronono*.
 Mine (pro).—*Ahy*.
 Mine (s).—*Lavan-tany misy vola mavy*.
 Mischief.—*Lozo* ; *Ratsy*.
 Misconduct.—*Ratsi-fitondran-tena*.
 Misery.—*Fahoriana*.
 Misfortune.—*Loza vitan-draisy*.
 Mislead.—*Tsi-Mitarikia marina*.
 Mistake.—*Diso*.
 Mistress.—*Tompovavy* ; *Tiana* ; *Razo*.
 Mix.—*Mangaro mampiharo*.
 Mixture.—*Zavatra voa haro*.

Money.—*Vola*.
 Moneyless.—*Tsi-manam-bela*.
 Monster.—*Biby*.
 Month.—*Vava*.
 Monthly.—*Isam-bolana*.
 Moon.—*Volana* ; *Fanjava*.
 Moonlight.—*Dia-volana*.
 Moor (s).—*Hona*.
 Morass.—*Honahona*.
 Morning.—*Maraina*.
 Mosquito.—*Moka*.
 Mount (v).—*Havoana* ; *Tendrombohitra*.
 Mountain.—*Bongo* ; *Vohitra* ; *Bohitra*.
 Chain of mountains.—*Bango lava*.
 Mouth (of harbour or river).—*Vava* ;
 Vavarano ; *Vinany*.
 Move (v).—*Mihitsikia*.
 Much.—*Balsaka-marô*.
 Mud, or clay (s).—*Fotaka*.
 Mud-bank.—*Tany mandrevo*.
 Multitude.—*Maro*.
 Murder.—*Vana-alenona*.
 Musician.—*Mpitsaka-mosikia*.
 Musket.—*Lasy* ; *Basy* ; *Ampingaratra*.
 Muslin.—*Hariry madinikia*.
 Mussulman.—*Ny mino any Mahomet*.
 Mutilate.—*Manapata-paka*.
 Mutineer.—*Mpira-itetikia* ; *Mpiodina*.
 Mutiny.—*Miray tetikia*.
 Myself.—*Izaho*, *hiany*.

 Naked.—*Mitanjaka*.
 Nail.—*Hoho* ; *Fantsikia*.
 Name.—*Anarana*.
 Narrow (water, sound, &c.).—*Salaka* ;
 Vavarana.
 Nasty.—*Maloto* ; *Vetavela*.
 Native.—*Tompon tany*.
 Naval.—*Sambo* ; *Aminy sambo*.
 Navigable.—*Azo aleham-tsambo*.
 Navigation.—*Ny fandehana an-*
 tsambo.
 Nay (ad).—*Tsia*.
 Near.—*Akaiky*.
 Nearly.—*Madiva* ; *Saiky*.
 Necessity.—*Vintana* ; *Alahelo* ; *Tsy-*
 maintsy.
 Neck.—*Voazona*.
 Neglect and negligent.—*Tsi-mitandrina*.
 Negro.—*Olona* ; *Maintinyita-volo*.
 Net (s).—*Haroto* ; *Vovo*.
 Never.—*Sanatria*.
 Neutral.—*Tsi-nomba ity tsi-nomba iry*.
 New, or novel.—*Vao*, *vuovao*, *very*.
 News (s).—*Teny vuovao* ; *Kabary*.
 Nice.—*Tsara* ; *Mahafinaritra*.

Night.—*Alina*.
 No (ad).—*Tsia*.
 Noble, or nobility.—*Adriana*; *Tsara*.
 Nobody.—*Tsy-misy alona*.
 Noise.—*Horakorako*.
 None.—*Tsy-misy*.
 Nonsense.—*Teny foana*; *Tsinontsinona*.
 Noon.—*Mitsidik' andro*.
 Noose (s).—*Tadi-vouvarana*.
 Nose.—*Orana*.
 Nothing.—*Tsinontsinona*.
 Nowhere.—*Tsi-aiza tsi-aiza*.
 Number.—*Isa*.
 Numerous.—*Maro*; *Diso-rata*.
 Nurse.—*Mpitaiza*.

Oar.—*Fivoy*. A large oar.—*Fivory lehibe*.
 Obedient.—*Manaraka*; *Mankuto*.
 Obedience.—*Fanajana*.
 Obey.—*Manaiky*.
 Obstinate.—*Maditra*.
 Occupy.—*Maka*; *Manana*.
 Of (prep).—*Aminy*.
 Off (ad).—*Afaka*; *Lasana*.
 „ (prep).—*Afaka*; *Lavitra*.
 „ (interj).—*Miala*.
 Offence.—*Heloka*.
 Offend.—*Mahalezitra*.
 Officer.—*Manaimbonanitra*.
 Offspring.—*Zanaka*.
 Oh ! (int.).—*Endre ! Indriay !*
 Oil.—*Solikia*.
 Ointment.—*Menaka*.
 Old.—*Antitra*.
 Olive-oil.—*Diloilo fihinana*.
 On (prep).—*Ambony*; *Nony*; *Aminy*.
 Onshore.—*Antanety*.
 Onward.—*Mandroso*; *Mizotra*.
 Oozy (a).—*Mandrevo*; *Be fotaka*.
 Opposite.—*Tandriky*; *Miatrikia*.
 Or (conj).—*Na*; *Sa*; *Angamba*.
 Ore (s).—*Zavatra*; *Alaina*; *Aminy tany tsy voa-rendrikiu*.
 Ornament.—*Ravaka*.
 Other (pron).—*Hafa*; *Anankiray*; *Ny hafa-hafa koa*; *Sasany*.
 Oven.—*Fitanehana*; *Memy*.
 Over.—*Ambovy*; *Manoatra*; *An-dafy*; *Manenikia*.
 Overboard.—*Latsaka an drano*.
 Overflow (v n).—*Mihoatra*.
 Overtake.—*Mahatratra*; *Mahasambotra*.
 Ounce.—*Lanjan' ariary*.
 Our (pron).—*Anry*; *Antsikia*.

Ourselves.—*Any hiany*; *Antsikia hian-ya antsi-kia*; *Isikia*.
 Out (ad).—*Ala-trana*; *Ivelany*; *Afaka*.
 Outcry.—*Antsoanto*.
 Outnumber.—*Manoatra ny isany*.
 Outrage.—*Manao aina*.
 Outside.—*Ny ivelany*.
 Owner.—*Tompony*.
 Ox.—*Ombi-rositra*.

Pack (v a).—*Mifehy entana*.
 Paddle (s).—*Fivoy*; *Fivé*.
 Paid (part).—*Voa loa*.
 Pain.—*Fampijalina*; *Ny maharary*; *Ny mainaintaina*.
 Painful.—*Maharary*; *Mahory*.
 Paint.—*Loko*; *Soratra*.
 Painter.—*Mapanoso doko*.
 Palace.—*Lapa*.
 Palanquin.—*Filanjana*; *Fitakonana*.
 Pale (a).—*Hatsatra*.
 Palisade.—*Rova*; *Fefy*.
 Palm (tree).—*Fela-tanana*; *Anaran-kazo*; *Fontsy*; *Satrana*; *Rofia*; *Anivona*.
 Pannier.—*Harona*; *Antomby*.
 Paper.—*Taratasy*.
 Parade.—*Fiomanana*; *Fanaovan-matso*.
 Parcel.—*Entana*.
 Pardon.—*Famelan-keloka*.
 Pardonable.—*Azo-avela*.
 Pare.—*Mamaofy*; *Miofy*.
 Parent.—*Ray nareny aman-dreny*.
 Parrot.—*Boloky*; *Vorona*.
 Parson.—*Mpumpianatra ny teny n'andria-manitra*.
 Port.—*Sasany*; *Anjara*; *Ila saina*; *An-daniny*.
 Partly.—*Saiky*; *Sasany*.
 Partner.—*Vady*; *Namana*; *Mpiombono*.
 Partridge.—*Tsipoy*.
 Pass (s).—*Lalana*; *Aleha*; *Faleha*.
 „ (v).—*Mandalo*.
 Passable.—*Azo-aleha*; *Mety*.
 Passionate.—*Malaki-tezitra*.
 Past (part).—*Lasa*; *Ny lasa*.
 Pastime.—*Lalaho*.
 Path.—*Lalana*; *Aleha*.
 Paw.—*Tanam-biby*; *Tongo-biby*; *Hoho*.
 Payment.—*Fandoavana*.
 Peace.—*Fiadanana*; *Fihavanana man-dry ny tany*.
 Peaceful.—*Miadana*; *Mandrifaizay*.
 Peak (of a mountain).—*Tendrombohitra Vohitra abo*.
 Pearl.—*Tsi-biby fotsy*.

- Peasant.—*Mpiasa*.
 Pelican.—*Anaram-borona*.
 Peninsula.—*Tanjona*; *Tsiraka*; *Oron-tani*.
 Pepper.—*Voam-perifery*.
 Perceptible.—*Hita*; *Azo*.
 Perfect.—*Yanteraka*; *Mandio*; *Marina*; *Tsara avoka*.
 Perfection.—*Hatsarana*.
 Perfidious.—*Mamitaka*; *Mivadibadikia*.
 Perhaps.—*Amgamba*.
 Peril.—*Loza*.
 Permanent.—*Maharitra*.
 Permit.—*Manela*.
 Peruvian bark.—*Landemy*.
 Pest.—*Lozo*; *Fahoriana*.
 Pestilence.—*Aretin-dratsy*; *Mifindra-findra*.
 Petition.—*Fangatahana*; *Fifonana*.
 Petticoat.—*Zipo anatiny*.
 Petty.—*Kely*; *Madinikia*.
 Physic.—*Fanafody*.
 Physician.—*Mpanao fanafody*.
 Pickaxe.—*Fangady marin-doha*.
 Picture.—*Sary*.
 Pie.—*Anaza-nahandro*.
 Pier.—*Tongo tatezana*.
 Pig.—*Lambo*.
 Pike.—*Lefona*.
 Pilfer.—*Mangalatra*.
 Pill.—*Fanafody atao teli-moka*.
 Pilot.—*Mpitari-tsambo*.
 Pious.—*Tsara fanahy*.
 Pirate.—*Mpangalatra ambony ny rano-masina*.
 Pistol.—*Polela*.
 Pit.—*Lavaka*; *Hantsana*.
 Pitch.—*Dity*.
 Plait.—*Foritra*; *Valona*.
 Plank.—*Hazo fisaka materima*.
 Plate.—*Vilia*.
 Playful.—*Tia laolao*.
 Pleasure.—*Hafaliana*; *Sitrakini fo*.
 Plentiful.—*Betsaka*.
 Plenty.—*Habelsahana*.
 Plot (s).—*Toko-tany*; *Tetekia*; *Hevitra*.
 Plum.—*Voaloboka maina*.
 Point.—*Tendrona*; *Ny iza*; *Indrindra fisa nonana*.
 Point of land.—*Orontany*; *Tsirakia*.
 „ of sand.—*Orongia*; *Arompasikia*.
 Police.—*Mpiambina*.
 Politeness.—*Fanjana*.
 Pomegranate.—*Amponga-lanitra*.
 Pond, or pool.—*Farihy*.
 Pony.—*Soavaly kely*.
 Poop.—*Vodi-sambo*.
 Poor.—*Malahela*.
 Porpoise.—*Fasotra*.
 Port (harbour). — *Futodian - tsambo*
Larehy bikia; *Seranauna*.
 Porter (carrier).—*Mpiambim-baravarana*;
Mpitamby; *Mpitondra*.
 Pot, or saucepan.—*Vilany*.
 Potato (sweet).—*Ovy*; *Vomanga*.
 Poverty.—*Alahelo*; *Tsi-fananana*.
 Poultry.—*Vorona ompiana akoho*.
 Powder (gun).—*Vanja*; *Pondy*.
 Powderhorn.—*Tandrokafitoeram-banja*.
 Powerful.—*Mahery*; *Matanjaka*.
 Praise.—*Dera*; *Fiderana*.
 Praiseworthy.—*Tokony ho deraina*.
 Prepare.—*Mamboatra*; *Mionana*.
 Presently (ad).—*Vetivety*.
 Preserve.—*Miaro*; *Mitahiry*.
 Preserver.—*Mpiaro*; *Mpitahiry*.
 Pretty.—*Tsara*; *Soa*; *Larehy*.
 Prevent.—*Misikana*; *Mandrara*.
 Price.—*Vidiny*.
 Pride.—*Rehareha*; *Arony*.
 Priest.—*Mpisorona*; *Mpivavaka*.
 Prince.—*Zanak' andrina-lahy*.
 Princess.—*Zanak' andriana-vavy*.
 Prison.—*Tranomaizina*.
 Prisoner.—*Babo*; *Olona*; *An-trano-maizana*.
 Prize.—*Sambotra*; *Babo*; *Loka-azo*.
 Prohibited.—*Mandrara*; *Rarana*.
 Prohibit, or sacred.—*Fady*; *Faly*.
 Promise.—*Fikiasana*; *Teny manome fan-antenana*.
 Promontory.—*Vodi-vona*.
 Proper.—*Mety*.
 Property.—*Fananana*; *Harena*.
 Protect.—*Miaro*; *Mitahiry*.
 Protection.—*Ao fiarovana*.
 Protector.—*Mpiady*; *Kiady*. I seek
 protection.—*Izaho mitady fiarovana*.
 Proud.—*Miavonavona*.
 Provender and provision.—*Hanina*.
 Prow, or bow.—*Lohan-Tsambo*.
 Pshaw (int.).—*Isy hia*.
 Pull.—*Mitarikia*; *Manongotra*.
 Pullet.—*Akoho-vavy kely*.
 Pumpkin, or pumpkin.—*Voaavo*.
 Punish (v).—*Mampijaly*; *Mikiapoka*;
Manono; *Ampijaliana*.
 Punishment.—*Kapoka*; *Loza*; *Fijaliana*.
 Purchaser.—*Mpividy*.
 Pure.—*Madio*; *Mahitsy*.
 Purple.—*Mena*; *Manga-mena*.
 Pursue.—*Manaraka*; *Arahina*; *Man-
enjikia*.
 Pursuit.—*Fanarahana*.
 Put (v a).—*Manetraka*; *Avela*.
 Putrid.—*Ratsy, lo mambo*.
 Puzzle.—*Manadala*. It puzzled me.—
Nanadala azy.

Quagmire.—*Honahona*.
 Quail (s).—*Papalikia*.
 Quality.—*Habeny*; *Be*.
 Quarantine.—*Ho andro*.
 Quarrel.—*Ady*; *Mifanditra*.
 Quarrelsome.—*Tia ady*.
 Quarterdeck.—*Fitoerana an-tsambo*.
 Queen.—*Mpanjaka-vavy*.
 Quick.—*Faingiana*.
 Quiet.—*Mandry*; *Malemy fanahy*.

 Rabbit.—*Rabitra*.
 Race (s).—*Mpianakavy*.
 Rag.—*Voro-damba*.
 Rage.—*Fahaterezana*.
 Raiment.—*Fitaftana*; *Akanjo*.
 Rain.—*Rano-norano*.
 Rancid.—*Malany*.
 Ransom.—*Avotra*; *manavotra*.
 Rascal.—*Olon-dratsy*. He is a rascal.—
Olon-dratsy izy.
 Rat.—*Voalavo*; *Valavo*.
 Rebel.—*Mpidina*.
 Rebellion.—*Fiodinana*.
 Receipt.—*Fandraisana*.
 Receive (v a).—*Mandray*; *Maka*;
Mameky.
 Recent (a).—*Vaovao*.
 Red.—*Mena*.
 Reed (s).—*Zavatra maniry poak' aty*;
Bararata.
 Refit.—*Mamboatra*.
 Refuge.—*Fiarovana*; *Aro*.
 Refusal.—*Fandavana*.
 Refuse.—*Mavda*.
 Regiment.—*Miramila*; *Toko*.
 Rejoice (v a).—*Mahafaly*.
 Relation.—*Havaa*.
 Release.—*Mahafaka*; *Mandefa*.
 Relic, or remainder.—*Sisa*; *Faty*.
 Rely (v n).—*Matoky*; *Miankina*.
 Remedy.—*Fanafoly*; *Famonjena*.
 Remote.—*Lavitra*.
 Remove.—*Manestora*; *Esorina*; *Miala*.
 Remunerate.—*Mamaly soa*.
 Remuneration.—*Valy*; *Fitia*.
 Renew.—*Manavao*; *Manesikia*; *Havaa*
ozina.
 Repair.—*Mamboatra*.
 Repairable (a).—*Azo amboarina*.
 Repast.—*Sakafo*; *Fihinonana*.
 Replace.—*Mamerina*; *Mametraka*.
 Repose.—*Matory*; *Mandry*.
 Reprimand.—*Fananarana*.

Reproach (s).—*Latsa*; *Tsiny*; *Kizak a-*
henatra.
 Reprobate.—*Ratsy*; *Olon-dratsy*.
 Reproof.—*Fananiana*; *Anatra*.
 Request.—*Mangataka*.
 Rescue.—*Mamonjy*; *Manafaka*.
 Resin.—*Ditin-kiazo*; *Anaran-dity*.
 Rest (s).—*Tory*; *Sisy*; *Ambiny*.
 Rest (v n).—*Matory*; *Maty*; *Mijano-*
ma; *Tsi-mihetsikia*; *Sisa*; *Tsilana*.
 Restore.—*Manonotra*; *Manefa mam-*
pody.
 Retake.—*Maka indray*.
 Retreat (s).—*Fierena*; *Fialana*.
 Return (v).—*Miverina*.
 Revenge.—*Mamaly ratsy*.
 Revenger, or avenger.—*Mpmaly ratsy*.
 Revisit.—*Manangy indray*.
 Revolt (v n).—*Miodina*. He revolted.—
Miodina izy.
 Revolution.—*Fihiodinana*; *Fiovana*.
 Reward.—*Fitia*; *Valim pitia*.
 Rewarder.—*Mpmaly soa*.
 Ribbon.—*Riba*.
 Rice.—*Vary*.
 Rice-water.—*Ranonampango*.
 Rich.—*Manan-karena*.
 Riches.—*Harena*.
 Rigging.—*Ny lay sy ny mahazak any*
sambo.
 Right, rightly.—*Marina*; *Havanana*;
Mahitsy.
 Riot (s).—*Tabataba*; *Fikiomiana*.
 Ripe.—*Masaka*; *Antitra*; *Tanteraka*.
 Rival.—*Mpiolona*; *Samy mitady*.
 Rivalry.—*Fialonana ady*.
 River.—*Reni rano*; *Ony*; *Saha*.
 Rivulet.—*Lalandriaka*; *Renirano kely*;
Saha kely.
 Road (on shore).—*Lalana*.
 Roar.—*Mierona*; *Midraradradra*.
 Roast (v a).—*Manatsatsikia*; *Milono*.
 Rob.—*Mangalatra*; *Mandroba*.
 Robber.—*Mpangalatra*.
 Robbery.—*Halatra*.
 Robe.—*Akanjo*; *Zipo*.
 Robust.—*Matanjaka*; *Mahery*.
 Rock.—*Vato-lampy*; *Vato bé*; *Harana-*
 A bed of rocks.—*Vato bé andrano-*
masina.
 Roof.—*Tafon-trano*.
 Room.—*Trano miefitra*.
 Roomy.—*Maluluka*.
 Root.—*Fakany*; *Anana*; *Izy mety ho*
hanina; *Fotony*; *Razana*.
 Rooted.—*Latsa-paka*.
 Rope, or cord.—*Tady*; *Taly*; *Hosy*.
 Rot (v n).—*Mihialo*.
 Rotten.—*Lo*.

Round.—*Vory* ; *Vorivory*.
 Ruby.—*Anaram-bato soa*.
 Rudder.—*Familian* ; *tsambo* ; *Hamory* ;
 Fanamory.
 Rude (a).—*Valavala* ; *To-adala*.
 Ruffian.—*Jio-lahy*.
 Ruin.—*Nirava* ; *Fandravina*.
 Ruinous.—*Mandrava*.
 Ruler.—*Mpanapaka* ; *Fitsipihana*.
 Rum.—*Toaka*.
 Rump.—*Vody*.
 Runaway (s).—*Mpandositra* ; *Mileja*.
 Rush (s).—*Herana* ; *Zozoro*. Large
 bog-rush.—*Fanihy*.
 Rusty.—*Misy* ; *Harafesina*.
 Ruthless.—*Tsi-miantra*.
 Rye (s).—*Anaram-barim-bazaha*.

 Sabbath.—*Alahady*.
 Sack.—*Kitrabo* ; *Lasaka*.
 Sad.—*Malahelo* ; *Manjorettra*.
 Safe-conduct (s).—*Pasipaoro*.
 Safe-guard.—*Aro* ; *Fiarovana*.
 Safely (ad).—*Sao-mantsava* ; *Finaritra*.
 Sail (s).—*Lain-tsambo* ; *Lay*. To be
 under sail.—*Milay*.
 Sailor.—*Mpivé* ; *Vezo*.
 Salt (a & s).—*Sira* ; *Fanasina*.
 Saltpetre.—*Naitrara*.
 Salutation.—*Fihiarahabana*.
 Salute (v s).—*Arahabaina*.
 Sample (s).—*Santatra* ; *Ohatra*.
 Sand.—*Fasikia* ; *Alanana* ; *Fasina* ;
 Bajina ; *Jia*.
 Sandbank.—*Tambohondrano*.
 Sandy-bottom.—*Fasimandrevo*, *fasiman-*
 dret-sotra, *fasimpolaka*.
 Sandal.—*Kapa*.
 Sapphire.—*Anaram-balo-soa*.
 Save (v a).—*Manonjy* ; *Miaro* ; *Mitahiry*.
 Save (ad) money, &c.—*Afatsy*.
 Saviour.—*Mpamonjy*.
 Saucepan.—*Vilany*.
 Sausage.—*Sesikia*.
 Saw.—*Mahita-tsofa* ; *Mamboly*.
 Scalp.—*Karan-doha*.
 Scanty.—*Kely* ; *Vitsy*.
 Scare (v a).—*Mampitahotra*.
 Scarlet.—*Mena* ; *Jaky*.
 Scholar.—*Mpianatra* ; *Mpanoratra*.
 Scissors.—*Hety*.
 Scold.—*Mitezitra*.
 Scorpion.—*Mamba-mbohitra*.
 Scoundrel.—*Karin' olona*.
 Scout (s).—*Mpizaha* ; *Tilitily*.

Scripture.—*Soratra masina*.
 Scull (s).—*Karan-doha*.
 Sea.—*Ranomasina* ; *Riaka*.
 Sea-breeze.—*Rivo-dranomasina*.
 Sea-chart.—*Sarin-dranomasina mila zany-*
 sisintany.
 Seaport.—*Filodian-tsambo*.
 Seal (mammal).—*Fandokoan-tarata*.
 Search.—*Mitady*.
 Season.—*Taona*. Rainy season.—*Asara*.
 Secret.—*Miery* ; *Mangino*.
 Secretary.—*Mpitondra-raharaha*.
 Secrete.—*Manafina*.
 Secure.—*Matoky* ; *Tsi-manana' hiahy Voa-*
 vonjy.
 Seditious.—*Mikiomy*.
 See (v).—*Mahita*.
 Seed.—*Voan-javatra* ; *Fotony* ; *Zanany*.
 Seek.—*Mitady*.
 Seizure.—*Fisamborana*.
 Seldom (a d).—*Mahalana*.
 Sell.—*Amidy*.
 Seller.—*Mpivaratra*.
 Senseless.—*Dangy* ; *Tsi miania* ; *Adala*.
 Sensible.—*Mahafantatra* ; *Mahita hen-*
 dry.
 Sentinel, or sentry.—*Mpiambina* ; *Tili-*
 tily.
 Sepulchre.—*Fasana*.
 Serious.—*Marina* ; *Maotina* ; *Tsi-tia-*
 vositra.
 Serpent.—*Bibi-lava*.
 Servant.—*Mpisarivy* ; *Mpanompo*.
 Shade.—*Aloka* ; *Aro*.
 Shallow.—*Marivo* ; *Tsi-lalin-tsaina*.
 Sham.—*Tsizy* ; *Mody*.
 Shame.—*Henatra*.
 Shameful.—*Mahamenatra*.
 Share (s).—*An-jara*.
 Shark.—*Akio* ; *Antsantsa*.
 She (pro).—*Izy* ; *Favavy*.
 Sheep.—*Ondry*.
 Sheep-cot.—*Fisoko*.
 Sheet-anchor.—*Vato-fantsikia lehebe*.
 Shells.—*Ankora* ; *Akora*.
 Shelter.—*Fiarovana* ; *Aro*.
 Shepherd.—*Mpiandry ondry*.
 Shield.—*Ampinga*.
 Shilling.—*Kirobo*.
 Shingle.—*Kapila-hazo*.
 Shipboard.—*Anaty sambo*.
 Ship master.—*Tompon-tsambo*.
 Shirt.—*Lobako*.
 Shoal.—*Marivo*.
 Shoes.—*Kiraro*.
 Shoot (v a).—*Mitifitra*.
 Shopkeeper.—*Mpivaratra*.
 Shore, beach.—*Morona*.
 Short.—*Fohy*.
 Shorten.—*Afohizina*.

Shot.—*Fatsaku*.
 Shroud (on a mast).—*Kofchindain tsambo*.
 Shut (v).—*Mandrindrina*.
 Sick (a).—*Marary*.
 Sicken.—*Manka-rary*.
 Sight.—*Fahitana*.
 Signal.—*Famamarana*.
 Signalize.—*Mahalaza*.
 Signature.—*Sinie*.
 Silence.—*Mangina*.
 Silk.—*Lamby*.
 Silk-dealer.—*Mpivaro-dandy*.
 Silk-worm.—*Ren-ilandy*.
 Silly.—*Miahonohona*.
 Silver.—*Vola-fotsy*.
 Similar.—*Mitovy*; *Sahala*.
 Since (ad).—*Hatry*.
 Sinew.—*Ozatra*.
 Sin.—*Heloka*; *Ota*.
 Sinful.—*Ratsy*; *Meloko*.
 Sing.—*Mihira*.
 Single.—*Tokana*; *Singiany*.
 Sink (v a).—*Milantikia*.
 Sir (s).—*Tompoko-lahy*; *Roundriana*.
 Sire.—*Ray*.
 Sister.—*Rahavavy*; *Anabavy*.
 Sit.—*Mipetraka*.
 Sixpence.—*Sikajy*.
 Skiff.—*Lakana maivana*.
 Skilful.—*Hendry*; *Kingia*; *Havina-vanana*.
 Skirmish.—*Adiady*.
 Skulk (v).—*Miery*; *Miafina*.
 Skull (s).—*Karan-doha*.
 Sky.—*Lanitra*.
 Slave.—*Andrevo*.
 Slaver (s).—*Ivy*; *Farora-bava*.
 Slaughter (s).—*Von' olona*.
 Slay.—*Mamono*.
 Sleep.—*Toritory*.
 Sleepy.—*Matoritory*.
 Slice (s).—*Iray didy*.
 Slight (a).—*Kely*; *Maivana*.
 Slippery.—*Malama*.
 Slope.—*Kisolo-solo*.
 Slothful.—*Kano malaina*.
 Slow.—*Miadana*.
 Sly.—*Fetsifetsy*. He is a sly man.—*Lehilahy fetsifetsy izy*.
 Small.—*Kely*.
 Smile (s).—*Vazivazy-hehy*.
 Smite.—*Mamely*; *Mametsaka*.
 Smith (s).—*Mpanefy*.
 Smoke (s).—*Setroka*.
 Smooth (a).—*Malama*; *Marina*.
 Snake.—*Bibi lava*.
 Snare (s).—*Fandrikinia*; *Longoa mitotobozaka*.
 Snore.—*Erotra*.

So (ad).—*Toy*; *Tahaka*; *Dia*; *Toa*; *Ka*.
 Soap.—*Savony*.
 Soft.—*Maleny*; *Mohaka*.
 Solder.—*Solo-hoto*.
 Soldier.—*Miaramila*.
 Solely.—*Irety*; *Iray*.
 Solicit.—*Mangataka*; *Mifona*.
 Solid.—*Mafy*; *Marina*.
 Some.—*Simisy sasany*.
 Somebody.—*Olona*.
 Somewhere.—*Iny ho eny*.
 Son.—*Zanaka-lahy*; *Zanalahy*.
 Song.—*Fihirana*.
 Soot.—*Malaly*.
 Soothsay.—*Maminany*.
 Sore.—*Fery*.
 Sorrow.—*Alehelo*.
 Sorry.—*Malohela ratsy*.
 Sot.—*Adala*; *Guigy*.
 Soul.—*Fanahy*; *Avelo*; *Saina*; *Aina*.
 Source.—*Lohany*; *Loha-rano*; *Ihia viany ischoany*.
 Sound.—*Feo*. I heard a sound.—*Nandre feo*.
 Sour (a).—*Maharikity*; *Malonilony*.
 Southward.—*Mianatsimo*.
 Sovereign.—*Mpanjaka*.
 Sow.—*Kisoa-vavy*.
 Sower.—*Mpanafy*.
 Straight, perpendicular or just.—*Marina*.
 Spawn.—*Alodin-kazandrano*.
 Speak.—*Miteny*.
 Spear.—*Lefona*.
 Spectator.—*Mpizaha*.
 Speech.—*Fiteny*; *Laha-teny*.
 Speechless.—*Tsi-mahateny*.
 Speed (a).—*Faingiana*.
 Spice.—*Hazo-manitra*.
 Spider.—*Hala*.
 Spike (s).—*Vi-lava*.
 Spin (v).—*Mamoly*.
 Spindle.—*Ampela*.
 Spirit (s).—*Fanahy*; *Matoatoa*; *Saina hevitra*.
 Spiritless.—*Votso-hevitra*.
 Spite, spitefulness.—*Lolom-po*. In spite of.—*No dia*.
 Split (v a).—*Manimaka*; *Mamaky-manelaka*.
 Spoil (s).—*Babo*; *Halatra*.
 Spoon.—*Sotra*.
 Spoonful.—*Erany ny sotra*.
 Sport.—*Lalao*; *Eso*; *Haza*.
 Spot.—*Tsiny*; *Latsa*.
 Spotless.—*Mahadio*.
 Spread.—*Mamelatra*; *Velarina*.
 Spring (of water).—*Loha-rano mitsambikina*.

- Spy (s).—*Mpitsikelo*. He is a spy.—*Mitsikelo izy*.
- Squall (s).—*Druara*.
- Squally.—*Mandrovotra*.
- Square.—*Efa-joro*.
- Squeeze.—*Manery*.
- Squirrel.—*Vontsira*.
- Stab (v).—*Mandratra*.
- Stable (a).—*Maritra*; *Mafy*.
- Stable (s).—*Tranon-Isoavaly*.
- Stagnant.—*Mandry*.
- Stake (s).—*Andriny*; *Tapa-kazo*.
- Stand (v).—*Mit-anjana*.
- Stand off.—*Miala*.
- Standard (s).—*Fancva*.
- Star.—*Kintana*.
- Starboard.—*Ny ankaviany sambo*.
- Starve.—*Maty mosary*; *Matin-katsiaka*.
- Stately.—*Tsara soa*.
- Stationary (a).—*Mitoetra*.
- Stay (v).—*Mijanona*.
- Steam (s).—*Foto*; *Etona*.
- Steep (a).—*Kisolosolo*; *Avo*.
- Steward.—*Mpitandrin-draharaha*.
- Stick (s).—*Tehina*; *Kilanjy tapa-hazo*.
- Sticky (a).—*Madity*.
- Stiff.—*Henjana*.
- Stifle.—*Mara-faty*; *Mamona*; *Manafina*.
- Sting.—*Fanindronana*.
- Stingy.—*Mahihitra*.
- Stink, or stinking.—*Maimbo*; *Malamy*; *Matsina*.
- Stocking.—*Ba*.
- Stomach.—*Vara-fo*.
- Stone.—*Vato*. Large flat stone.—*Lampy*.
- Stool.—*Fiketrahana*.
- Store.—*Akamaroany*; *Rakitra*; *Zava-tahiry*; *Haciny*.
- Storm of wind.—*Rivo-lahy*; *Rivomena*.
- Stove.—*Fatana*.
- Stout, or sturdily.—*Matanjaka*.
- Straight.—*Mahitsy*.
- Strait.—*Ety*; *Mahory*; *Tery*.
- Strand.—*Morony*.
- Stranger.—*Vahiny*.
- Strangle.—*Manenda*.
- Straw.—*Mololo*.
- Stray, or straggle.—*Miriorio*; *Mivily*.
- Stream.—*Reni-rano*.
- Strength.—*Hery*.
- Strengthen.—*Mampahery*.
- Stripe.—*Ady*.
- Strike.—*Mikapoka*; *Mamely*; *Man-daboka*.
- Stripe (s).—*Soratra*; *Tsipikia*.
- Stripped.—*Misoratsoratra*.
- Strive.—*Miady*.
- Stroke (s).—*Kapoka*; *Ady*.
- Strong.—*Malanjaka*; *Mahery*.
- Stronger.—*Maherihery kokoa*.
- Stubborn.—*Maditra*.
- Student.—*Mpianatra*.
- Stun (v).—*Maharenina*.
- Stupid.—*Adala*; *Votsa-heritra*.
- Stupify.—*Manadala*.
- Subaltern.—*Olom-pehiny*.
- Subdue.—*Mandresy*.
- Submerge.—*Manitrikia*.
- Submit.—*Maneky*; *Mamela*.
- Subsist.—*Misy*; *Mitoetra*; *Maharitra*.
- Substitute.—*Solo*.
- Subtile.—*Fetsifetsy*.
- Succour.—*Famonjena*; *Fanampiana*.
- Such (pr).—*Tahaka*; *Toy*.
- Suck (v n).—*Mikoka*; *Minono*; *Mit-sentsitra*.
- Sudden.—*Tampoko*.
- Suffer.—*Mihiafy*; *Maharitra*; *Mamela*.
- Sufferer.—*Farary*; *Farofy*; *Mpamela*.
- Suffering.—*Faharariana*; *Fahoriana*.
- Sufficient.—*Ampy*; *Antoniny*.
- Sugar.—*Sera-mamy*.
- Suicide (s).—*Famonoan-tena*.
- Suitable.—*Onony*; *Mety*.
- Sullen.—*Minonjomonjo*.
- Sulphur.—*Solojara*.
- Summit.—*Tampony*.
- Sun.—*Masoandro*.
- Sunshine.—*Hain' andro*.
- Superb, or superfine.—*Tsara avo*.
- Superintendent.—*Mpitan-iriana*; *Mpi-fehy*.
- Superstition.—*Fivavahana tsizy*.
- Suppliant.—*Mifona*.
- Supplication.—*Hataka*.
- Support (s).—*Tohana*.
- Supreme.—*Ambony lehibe*.
- Sure (a).—*Niarina*; *Mafy*; *Tsi-miova Tsara*.
- Surely (ad).—*Fantatra*; *Marimarina*.
- Surface.—*Ny ivelany*.
- Surgeon.—*Mpanisy fanafody*; *Mpanao*.
- Surprise (v n).—*Manampoka*; *Maha-gaga*.
- Surrender (v a).—*Maniaky*; *Manome*.
- Surround (v a).—*Hodidinina*.
- Survive.—*Tratra velona*.
- Suspect, or suspicious.—*Miahiahy*.
- Suspicion.—*Ahiahy*.
- Swamp.—*Honahona*.
- Sweet.—*Mamy*.
- Sweetheart.—*Sakaiza*.
- Swift.—*Faingina*.
- Swim (v).—*Milomano*.
- Sword.—*Sabatra*.

- Table.—*Latabatra*.
 Take (v).—*Entina*.
 Talebearer.—*Mpitati-bolana*.
 Talisman. charm.—*Sampy* ; *Odu*.
 Tall (a).—*Lava*.
 Tame (a).—*Manompo* ; *Voa folaka*.
 Tank (s).—*Vata lehibe* ; *Fandroana*.
 Tanner.—*Mpandon-koditra*.
 Tapioca.—*Vomangahazo*.
 Target.—*Ampingia*.
 Tavern.—*Trano fixarotun-toaka*.
 Tax.—*Helra*.
 Tea.—*Dite*.
 Teacher.—*Mpampianatra*.
 Tear, a rent.—*Triarina*.
 Tear, from the eye.—*Rano-maso*.
 Teat and udder.—*Nono*.
 Telescope.—*Maso-lavitra*.
 Tell (v).—*Laziana*.
 Tender (a).—*Malemy* ; *Mora-be* ; *Miantra*.
 Tenement.—*Trano* ; *Fonchana*.
 Tent.—*Lay* ; *Toby*.
 Tenth.—*Fohatolony*.
 Terrible.—*Mahatahotra*.
 Terrify.—*Mampitahotra*.
 Terror.—*Tehotra*.
 Than (ad).—*Noho*.
 Thanks.—*Sotra*.
 Thankful.—*Misaotra*.
 That (pro).—*Iroa*.
 Thatch (s).—*Mololo arao tafon-trano*.
 The.—*Ny*.
 Thee.—*Ialahy* ; *Itena*.
 Thereon.—*Amboniny marak' izany*.
 Thereto.—*Haterizany*.
 Thereupon.—*Ary* ; *Aia*.
 Therewith.—*Miaraka aminy izany*.
 Therewithal.—*Ary koa*.
 Theft.—*Halatra*.
 Them (pro).—*Azy*.
 Themselves.—*Izy*.
 There.—*No* ; *Eo* ; *Any* ; *Ery*.
 Thereabout.—*Aohuo*.
 Thereat.—*Aminy*.
 Thereby.—*Izany*.
 Therefore.—*Koa* ; *Ka*.
 Therein.— *Ao* ; *Aminy*.
 These.—*Iretoana*.
 Thick.—*Matevina*.
 Thicket.—*Hazo matevina*.
 Thief, bandit.—*Jiolahy* ; *Mpijirika*.
 Thin.—*Manify mahia*.
 Thing.—*Zavatra*.
 This.—*Ity*.
 Thorn.—*Tsilo*.
 Those.—*Ireroa*.
 Thou.—*Ialahy* ; *Hianao*.
 Thoughtless.—*Tsi-mihevitra*.
 Thrash (v a).—*Mively* ; *ma Mely*.
 Thread.—*Taretra*.
 Threat, or to threaten.—*Mandrahona*.
 Thrive (v n).—*Maroroka mandroso*.
 Throat.—*Tenda*.
 Throne.—*Lapa*.
 Throw.—*Atoraka Ariana*.
 Thrust (v).—*Manosikia*.
 Thunder.—*Varatra*.
 Tide.—*Ny mitombo sy misintona* ; *Aminy ranomasina*.
 Tight.—*Hanjana*.
 Timber.—*Hazo*.
 Time.—*Andro taona fetra*.
 Timid.—*Oza*.
 Tinman.—*Mpanefy vi fotsy*.
 Tobacco.—*Paraky*.
 Toe.—*Rantsan-tongotra*.
 Told.—*Eja* ; *Voa laza*.
 Toll (s).—*Hetra* ; *Sara*.
 Tooth.—*Nify*.
 Torch.—*Fanilo*.
 Torment (v a).—*Mampijaly*.
 Tornado.—*Tardio*.
 Torpid.—*Ngoly*.
 Torrent.—*Riaka* ; *Riana*.
 Torture.—*Fijaliana*.
 Tough.—*Maozatra* ; *Mafy*.
 Town.—*Vohitra* ; *Tanambe*. Chief town.
 —*Lonaka*.
 Townsman.—*Mpiray monina*.
 Track.—*Dia*.
 Traffic.—*Varotra*.
 Traitor.—*Mpikiomy*.
 Trap.—*Fandrikia tonta*.
 Travel.—*Mandeha miasa*.
 Traveller.—*Mpandehandeha aminy tany hafa*.
 Treacherous.—*Tsi-mahatoky mama-dikia*.
 Treason.—*Kiomy*.
 Treasure.—*Harena rakitra*.
 Treaty.—*Fanekaina*.
 Tree.—*Hazo-maniry*.
 Tremble.—*Mangovitra*.
 Trench.—*Hady manda*.
 Trial.—*Fitsarana* ; *Fanandramana*.
 Trick.—*Soloky* ; *Fitaka*.
 Trivial.—*Tsi-misy vidiny*.
 Triumph.—*Fahafaliana*.
 Troop.—*Andiany*.
 Trophy.—*Famantorany hery*.
 Troublesome.—*Manahirana*.
 True.—*Marina*.
 Truce.—*Fatsaharana*.
 Try (v).—*Andramana*.
 Tumult.—*Tabataba*.
 Turkey.—*Voron-tsi-loza*.
 Turpentine.—*Lasantsy*.
 Turtle.—*Rere*.
 Tutor.—*Mpampianatra*.
 Tyranny.—*Fan aovon-tsi-trapo*.

- Ugly.—*Ratsi-tareha*.
 Ulcer.—*Fery*.
 Uncivil.—*Tsi-manaja*.
 Unconcerned.—*Tsi-mitandrina*.
 Unconquerable.—*Tsi-azo-resena*.
 Unable.—*Tsi-mahay*.
 Unalterable.—*Tsi-azo ovona*.
 Unauthorized.—*Tsi-lenin' andriana*.
 Unbeliever.—*Tsi-mino*.
 Uncertain.—*Misalasala*.
 Uncomfortable.—*Tsi-finaritra*.
 Undamaged.—*Tsi-simba*.
 Undaunted.—*Tsi-matahotra*.
 Undeceive.—*Maneho ny fitaka*.
 Undertake.—*Manao*.
 Undeserved.—*Tsi-tokony homena*.
 Undoubted.—*Ekena*.
 Unfold, or unroll.—*Mamelotra*.
 Unfriendly.—*Tsi-misakaiza*.
 Ungodly.—*Ratsi-fanahy*.
 Unguarded.—*Tsi-mitandrina*.
 Unheard.—*Tsi-re*.
 Unhurt.—*Tsi-Maratra*.
 Uninhabited.—*Tsi-misy mponina*.
 Unjust.—*Tsi-marina*.
 Unknown.—*Tsi-fantatra*.
 Unlawful.—*Tsi-mety*.
 Unmerciful.—*Tsi-antra*.
 Unpaid.—*Tsi-voa loa*.
 Unpardonable.—*Tsi-azo ifonana*.
 Unreasonable.—*Tsi-tokony*.
 Unrelieved.—*Tsi-voa vonjy*.
 Unskilful.—*Tsi-mahay*; *Tsi-konjo*.
 Unsuccessful.—*Tsi-ambininy*; *Tsi-lavorary*.
 Untrue.—*Tsi-marina*.
 Untruth.—*Baingia*.
 Unwell.—*Marary*.
 Unworthy.—*Tsi-tokony*.
 Upright.—*Mijoro*; *Marina*.
 Upside down.—*Mifototra*.
 Urgent.—*Tsi-azo ahilana*.
 Us (pron).—*Izahy*; *Anay*.
 Use, usage.—*Fanao*.
 Use (v n).—*Zatra*; *Tamana*.
 Useful.—*Mahasoa*.
 Useless.—*Tsi-mahasoa*.
 Vagabond.—*Mirenireny*.
 Valley.—*Lohasaha*.
 Valour.—*Herim-po*.
 Valuable.—*Saro-biby*.
 Variable.—*Miovaova*.
 Variance.—*Tsi-fitovana*.
 Variety.—*Fiovana*; *Tsi-toviana*.
 Vary.—*Miovaova*.
 Vassal.—*Mpanompo*.
 Vault.—*Lavaka*; *Zohy*.
 Vegetable.—*Anana*.
 Vend.—*Mivarotra*.
 Venomous.—*Mahafaty*.
 Venerable.—*Alahorana*; *Hajaina*.
 Vengeance.—*Famaliana*.
 Venison.—*Haza*.
 Verdant, verdure.—*Maritso*.
 Vermin.—*Biby madinikia*.
 Vestige.—*Dia*.
 Vice.—*Fahotana*; *Vahoho*.
 Viceroy.—*Solon' andriana*.
 Vicious.—*Ratsy fanahy*.
 Victor.—*Mpandresy*.
 Victorious.—*Mandresy*.
 Victual.—*Hanina*.
 Vigour.—*Hery*.
 Vigorous.—*Mtanjaka*.
 Vile (a).—*Ratsy*; *Vetaveta*.
 Village.—*Vohitra mandinikia*; *Tanana*.
 Villain.—*Olon-dratsy*.
 Villainous.—*Ratsy*.
 Violence.—*Ditra*.
 Viper.—*Bibi-lava*.
 Visible.—*Mischo*; *Hita*.
 Visit.—*Mamangy*.
 Volley (s).—*Ny miara-mitifitra*.
 Voluntary.—*Sitra-po*.
 Voracious.—*Liana*.
 Vow.—*Voady*.
 Wade (v).—*Mandeha anati-rano*.
 Wager.—*Loko*.
 Wages.—*Karama*.
 Waist.—*Valahana*.
 Wait.—*Miandry*.
 Walk.—*Mitsangantsangana*.
 Walking-staff.—*Tehina*.
 Wall.—*Ampin-tany*; *Rindrina*.
 War.—*Tafikian' ady*.
 Warm (a).—*Mafana*.
 Warm (v a).—*Mananatra*.
 Warp (s).—*Fahan-tenona*.
 Warrior.—*Mpiady*.
 Wash.—*Manaso*; *Sasana*.
 Wasp.—*Fanenitra*.
 Waste (v).—*Kanilonina*.
 Watch (v).—*Famantoràn' andro*.
 Watchword.—*Baikio*.
 Water.—*Rano*.
 „ fresh.—*Rano-mamy*.
 „ salt.—*Rano-masina*.
 „ brackish.—*Rano-boka*; *Rano-masi-rasira*.

Water-fowl.—*Voronan-drano*.

Wave (s).—*Alon-drano*.

Wave (v).—*Mikiopakopaka*.

Wax.—*Savoka*.

Way (s).—*Lalana*.

Wayfarer.—*Mpivakiny*.

We (pro.).—*Isikia ; Izahay*.

Weak.—*Baraka*.

Wealthy.—*Manan-karena*.

Weary.—*Sasatra*.

Weather-driven.—*Entin-drivotra*.

„ fine weather.—*Maina ny andro*.

„ rainy weather.—*Hanorana ny andro*.

Weaver.—*Mpanenona*.

Wedding and wedlock.—*Tanam-bodiana*.

Weed.—*Bozaka ; Ahitra*.

Week.—*Herin' andro*.

Weigh.—*Lanjaina*.

Welcome.—*Fampiandroana*.

Wet.—*Patsapetsa*.

Whale.—*Trozona*.

Wharf.—*Fitadian-dakana*.

Wheel.—*Kodiarana*.

When (ad).—*Rahoviana*.

Whip.—*Fikiapohana ; Kapohina*.

White (a).—*Malandy ; Fotzy ; Foty*.

Wholesome.—*Maheri-soa*.

Wicked.—*Ratsia-fanahy*.

Wife.—*Vady*.

Wilderness.—*Efitra*.

Willing, willingness.—*Sitra-po*.

Window.—*Varavaran-kely*.

Wing.—*Elatra*.

Winter.—*Ririnina*.

Wire.—*Tari-by*.

Wise.—*Hendry*.

Wisdom.—*Fahendrena*.

With (prep.).—*Anamy ; Amina*.

Withdraw.—*Manestra*.

Within (prep.).—*Dia natiny*.

Witness (v).—*Vavolom belona*.

Woe (s).—*Loza*.

Woman.—*Vary*.

Wood.—*Hazo*. Fire-wood.—*Kitay*.

Wreck.—*Sambo simba an-dranomasina*.

Wretch.—*Olon' ory ; Olon dratsy*.

Write.—*Manoratra*.

Wrong.—*Diso*.

Yacht.—*Sambo-kely*.

Yam, or sweet potato.—*Ory*.

Year.—*Taona*.

Yellow.—*Vony*.

Yes.—*Iny*.

Yonder.—*Iroa ; Any*.

You (pro.).—*Hianao*.

Younger.—*Zandriany ko-koa*.

Your (pro.).—*Anao*.

Yourself.—*Hianao ; Tenanao hiany*.

Zealous.—*Hazotoana*.

Zinc.—*Funitso*.

INFORMATION RELATING TO CHARTS, SAILING DIRECTIONS, AND THE GENERAL NAVIGATION OF H.M. SHIPS.

ON THE CORRECTION OF CHARTS, SAILING DIRECTIONS, AND LIGHT LISTS.

THE three descriptions of publications as guides to navigation, which are affected by the continual changes and alterations that take place, are the Charts, the Sailing Directions, and the Light Lists.

Of these the Charts should always be, so far as our knowledge permits, absolutely correct to date; the Sailing Directions, however, cannot, from their nature, be so corrected, and *in all cases where they differ from charts, the largest scale chart must be taken as the guide for navigation.*

The Light Lists are corrected annually.

1. *Charts*.—When issued to a ship on commissioning, the charts have received all necessary corrections to date. As sent from the Hydrographic Department they are correct to the date of issue as stamped on each folio. They then receive such corrections by hand in the dépôts as are required, and are so issued to the ships.

The charts in the folios should have the same number and title as shown against each in the Lists pasted on the outside of the folio. The Navigating Officer is to satisfy himself that they do so agree before signing the receipt for the charts, &c.

All small but important corrections affecting navigation that can be made by hand are notified by Notices to Mariners, and should at once be placed on the charts to which they refer, in accordance with the following uniform system:—

1. All corrections, additions to, or erasures on charts are to be neatly made in *red* (except as explained later in paragraph 6). In every case the recognised chart abbreviations are to be used.


2. The number and date of every Notice to Mariners, from which corrections, &c., as above have been made, are to be entered at the lower left-hand corner of the chart, in *red*, in the following manner, viz.:—

07 . 123, 1145, 1503; 08 . 232; 10 . 1506, 1721; 11 . 34, &c.

3. The *amount* of the substance of a Notice to Mariners inserted on the chart should as a general rule be limited to what is likely to be engraved on the chart plate when corrected in office, and it should also be inserted as far as possible in a similar style; thus:—

(a) the amount of information to be inserted depends on the scale of the chart, and should be in accordance with that already engraved on the chart. On the largest scales will generally be found all the principal details of lights and their sectors, buoys, &c. On the smallest scales buoys are seldom inserted, and lights are only briefly described as Lt. F., Lt. Gp. Fl., Red, &c., &c., without any details as to height, visibility, periods, &c.

(b) when inserting corrections, care must be taken not to obliterate any of the other information already on the chart;

(c) wrecks are shown thus,  "Wreck," and on large scales the "year" is added;

(d) when "Notes" are to be inserted (such as Cautionary, Tidal, &c.) they should be written in a convenient but conspicuous place, where they will not interfere with any other details.

4. The numbers and dates of Notices should *not* be entered on the Charts, except as required by paragraph 2, as they only tend to the increase of illegibility.

5. Erasures, when necessary, should consist of a single line made with a pen. A knife or ink eraser should not be used.

6. Temporary or intended changes should be inserted on the chart in pencil, and in the latter case finally inked in, in red, when further notice has been received confirming the previous one.

7. One copy of each Notice to Mariners should be pasted into the Sailing Directions in its appropriate place, so that, if fuller detail is required than what the scale of the chart permits to be given, it may be found on the proper page referring to the given locality or subject.

When these corrections are so large that they cannot be conveniently thus made they are put upon the plates, and fresh copies are issued to the ships to replace the others, which are directed to be destroyed to prevent the possibility of their being used in the navigation of the ship.

The dates on which these large corrections are made are noted on the chart plates under the heading of "New Editions" in the middle of the lower edge; those of the smaller corrections at the left-hand lower corners as "Small Corrections."

In all cases of quotations of charts, these dates of corrections should be given, as well as the number of the chart (which will be found in the lower right-hand corner), in order that at the Admiralty it may be known what edition of the chart is referred to, and to what date the chart has been corrected.

It should be remembered that in addition to the large and small corrections here mentioned, the chart plates are being constantly corrected for numerous details not considered to be of such a nature as to affect safe navigation. For these corrections the charts are not necessarily dated, nor are any Notices to Mariners issued, and it follows therefore that two charts, both bearing the same dates of "New Editions" and "Small Corrections," may not exactly agree in all respects.

2. *The Sailing Directions* are not corrected before issue, but on page iii. in the "Advertisement" to each volume will be found the number of the last Notice to Mariners used in its revision, the numbers of the subsequent Notices affecting it between going to press and issue to H.M. Ships are given in the Notice to Mariners announcing its publication.

Supplements and Revised Supplements referring to each volume are published from time to time. Supplements contain all the information received up to date since the publication of the volume to which they refer, and a Revised Supplement cancels the previous Supplement.

The existence of a Supplement is to be noted in the tabular form placed for the purpose inside the cover of each volume, and also on receipt of a further Revised Supplement after commission. Two copies are issued to each ship, one of which is to be retained intact, for reference, notations referring to it being made on the pages of the Sailing Directions affected; the other copy may be cut up, if considered desirable, the slips being pasted in the volume at the appropriate place.

In the advertisement to each Supplement will be found the number of the last Notice to Mariners used in its compilation.

In January of each year, a summary of the information affecting each volume of Sailing Directions, which has been published during the preceding year in Notices to Mariners, is issued in a separate publication. If a Supplement or Revised Supplement has been issued during the year, this summary will only include Notices to Mariners issued since the date of such Supplement; if one is in preparation at the end of the year, no summary will be issued. These summaries are only issued to H.M. Ships with the books to which they refer.

An early duty of the Navigating Officer after drawing a chart set is to correct the Sailing Directions from the Supplements or Revised Supplements, Annual Summaries of Notices to Mariners and Notices to Mariners supplied with the chart set.

As Notices to Mariners prior to the date of issue of a chart set from the Hydrographic Department are not supplied with the set, he should demand from that Department such Notices to Mariners as are required to complete the interval between the last published Supplement, Revised Supplement, or Summary of Notices to Mariners, and the first number of the Notices to Mariners drawn with the chart set.

One copy of each Notice to Mariners should be pasted into the Sailing Directions in its appropriate place as soon as received.

It must, however, be thoroughly understood that Sailing Directions will never be correct in all minor details, except up to the date of the last Supplement or Revised Supplement, and that, as already stated, when differences exist, the chart, which should be corrected from the most recent information, should be taken as the guide; for which purpose, for ordinary navigation, they are sufficient.

3. *The Light Lists*, annually published at the beginning of each year, are not corrected in the dépôts before issue, but appendices are issued every week with the weekly copies of Notices to Mariners, giving the alterations that have taken place.

It is the duty of the navigating officer when he receives the set of charts to make notations in the Light Lists from these appendices, and from Notices to Mariners of later date; and to keep them so corrected from time to time.

The Light Lists should always be consulted as to the details of a light, as the description in the Sailing Directions does not embrace the sectors, and the other information on the lights may be obsolete, in consequence of changes made since publication. A red label to this effect is inserted opposite page 1 of all Sailing Directions. The charts also may not be equally up-to-date in some details, for which no Notices to Mariners have been issued.

THE USE OF CHARTS AS NAVIGATIONAL AIDS AND GENERAL REMARKS RELATING TO PRACTICAL NAVIGATION.

1. *Reliance on a Chart*.—The value of a chart must manifestly depend upon the accuracy of the survey on which it is based, and this becomes more important the larger is the scale of the chart.

To estimate this, the date of the survey, which is always given in the title, is a good guide. Besides the changes that, in waters where sand or mud prevails, may have taken place since the date of the survey, the earlier surveys were mostly made under circumstances that

precluded great accuracy of detail, and, until a plan founded on such a survey is tested, it should be regarded with caution. It may, indeed, be said that, except in well-frequented harbours and their approaches, no surveys yet made have been so minute in their examination of the bottom as to make it certain that all dangers have been found. The fullness or scantiness of the soundings is another method of estimating the completeness of a chart. When the soundings are sparse or unevenly distributed, it may be taken for granted that the survey was not in great detail.

It appears to be insufficiently realised that the degree of reliance which may reasonably be placed upon an Admiralty chart, even in surveys of modern date, is mainly dependent on the scale on which the survey was made. The scale for publication is now generally that of the original survey, except in the case of Coast sheets, which are sometimes reduced. It should not, therefore, be assumed that the original survey was made on a larger scale than that published.

It must be borne in mind that the only method of ascertaining the inequality of the bottom of the sea is by the laborious process of sounding, and that in sounding over any area, the boat or vessel obtaining the soundings is kept on given lines; that each time the lead descends it only ascertains the depth of water over an area equal to the diameter of the lead, that is about two inches, and that consequently each line of soundings, though miles in length, is only to be considered as representing a width of two inches.

Surveys are not made on uniform scales, but each survey is made on a scale commensurate with its apparent importance. For instance, a general survey of a coast which vessels only pass in proceeding from one place to another is not usually made on a scale larger than one inch to the nautical mile, while surveys of areas where vessels are likely to anchor, are made on a scale of three inches to the mile, and surveys of frequented ports, or harbours likely to be used by Fleets, on a scale of from six inches to ten inches to the nautical mile.

Close examination by sounding is the only method by which surveys on a large scale can be made, and in view of the vast mileage of surveys yet requiring completion in the interests of navigation, it would be a waste of time to undertake large scale Coast surveys.

The scale on which a survey is to be conducted having been settled, it is manifestly superfluous to obtain more lines of soundings than can be represented on the paper. 100 soundings, which is the maximum number that can be placed with clearness on every square inch of paper, means that on a scale of one inch to the mile each sounding on the chart occupies an area representing eight acres of actual ground, whilst on a scale of six inches to the mile each sounding represents an area of a little less than a quarter of an acre, i.e., of 100 feet square.

The following diagram represents as many soundings as can be placed legibly on a square inch of paper:—

16	15	15	13	14	12	11	10	9
14	15	14	14	13	13	12	11	9
15	15	14	17	16	14	13	10	9
16	16	17	18	16	12	11	8	10
16	17	15	12	9	7	7	7	10
19	16	12	9	5	4	5	6	9
22	19	16	10	5	5	6	7	10
20	16	12	7	5	5	6	7	10
16	13	11	9	7	7	8	10	11
23	17	14	11	12	10	9	10	11

Little assistance in detecting excrescences on the bottom is afforded by the eye, when sounding in a boat, even in clear weather, on account of the observer being within five feet of the surface; none in turbid seas. If, therefore, there is no inequality in the soundings to cause suspicion, a shoal patch between two lines may occasionally escape detection.

Lines of soundings plotted as close as may be practicable on a scale of 6 inches to the mile would be 100 feet apart, and each line would be only 2 inches in actual width.

Thus, in a chart on a scale of one inch to the mile, an inequality of some acres in extent rising close to the surface, if it happened to be situated between two lines, might escape the lead; whilst in a chart on a scale of 6 inches, inequalities as large as battleships, if lying parallel to, and between the lines of soundings, might exist without detection if they rose abruptly from an otherwise even bottom.

General Coast charts should not, therefore, be looked upon as infallible, and a rocky shore should on no account be approached within the contour line of 10 fathoms, without taking every precaution to avoid a possible danger; and even with surveys of harbours on a scale of 6 inches to the mile, vessels should avoid, if possible, passing over charted inequalities in the ground, as some isolated rocks are so sharp that the lead will not rest on them.

Blank spaces among soundings mean that no soundings have been obtained in these spots. When the surrounding soundings are deep it may with fairness be assumed that in the blanks the water is also deep; but when they are shallow, or it can be seen from the rest of the chart that reefs or banks are present, such blanks should be regarded with suspicion. This is especially the case in coral regions and off rocky coasts, and it should be remembered that in waters where rocks abound it is always possible that a survey, however complete and detailed, may have failed to find every small patch.

A wide berth should therefore be given to every rocky shore or patch, **and this rule should be invariably followed, viz., that instead of considering a coast to be clear unless it is shown to be foul, the contrary should be assumed.**

2. Fathom Lines a Caution.—Except in plans of harbours that have been surveyed in detail, the five-fathom line on most Admiralty charts is to be considered as a caution or danger line against unnecessarily approaching the shore or bank within that line, on account of the possibility of the existence of undiscovered inequalities of the bottom, which nothing but an elaborate detailed survey could reveal. In general surveys of coasts or of little frequented anchorages, the necessities of navigation do not demand the great expenditure of time required for such a detailed survey. It is not contemplated that ships will approach the shores in such localities without taking special precautions.

The ten-fathom line is, on rocky shores, as before mentioned, another warning, especially for ships of heavy draught.

Charts where no fathom lines are marked must be especially regarded with caution, as it generally means that soundings were too scanty and the bottom too uneven to enable them to be drawn with accuracy.

Isolated soundings, shoaler than surrounding depths, should always be avoided, especially if ringed round, as there is no knowing how closely the spot may have been examined.

3. Chart on largest scale always to be used.—It sometimes happens that, from press of work, only the copper plate of the larger scale chart of a particular locality can at once receive any extensive re-arrangement of coastline or soundings. This is an additional reason, besides the obvious one of the greater detail shown, why this largest scale chart should always be used for navigating.

4. Caution in using Small Scale Charts.—In approaching the land or dangerous banks, regard must always be had to the scale of the chart used. A small error in laying down a position means only yards on a large scale chart, whereas on a small scale the same amount of displacement means large fractions of a mile. This is particularly to be observed when coming to an anchor on a narrow ledge of convenient depth at some distance from the shore.

For the same reason bearings to objects near should be used in preference to objects farther off, although the latter may be more prominent, as a small error in bearing or in laying it down on the chart has a greater effect in misplacing the position the longer the line to be drawn.

5. Graduation.—All Plans are now being graduated in skeleton style before publication in order to facilitate easy reference to Astronomical positions; previously published plans are also graduated as opportunity offers. The graduation is, however, of necessity, often based upon imperfect information of a conflicting nature; for this reason, whenever an Astronomical position is quoted other than approximate (*i.e.*, when seconds are given), it is necessary to quote also the number of the particular chart from which the position has been derived.

6. Distortion of Printed Charts.—The paper on which charts are printed has to be damped. On drying, distortion takes place from the inequalities in the paper, which greatly varies with different paper and the amount of the original damping; but it does not affect navigation. It must not, however, be expected that accurate series of angles taken to different points will always exactly agree, when carefully plotted upon the chart, especially if the lines are to objects at some distance. The larger the chart the greater the amount of this distortion.

7. Buoys.—It is manifestly impossible that any reliance can be placed on buoys always maintaining their exact position. Buoys should therefore be regarded as warnings and not as infallible navigating marks, especially when in exposed positions; and a ship should always, when possible, be navigated by bearings or angles of fixed objects on shore and not by buoys.

Gas Buoys.—The lights shown by gas buoys cannot be implicitly relied on, as, if occulting or flashing, the apparatus may get out of order, or the light may be altogether extinguished. These lights in the British islands are from 5 to 217 candle power.

8. Lights.—Circles drawn on charts round a light are not intended to give information as to the distance at which it can be seen, but solely indicate, in the case of lights which do not show the same characteristics or colours in all directions, the bearings between which the differences occur.

All the distances given in the Light Lists and on the charts for the visibility of lights are calculated for a height of an observer's eye of 15 feet. The table of distances visible due to height, at the end of

each Light List affords a means of ascertaining how much more or less the light is visible should the height of the bridge be more or less. The glare of a powerful light is often seen far beyond the limit of visibility of the actual rays of the light, but this must not be confounded with the true range. Again, refraction may often cause a light to be seen farther than under ordinary circumstances.

When looking out for a light at night, the fact is often forgotten that from aloft the range of vision is much increased. By noting a star immediately over the light a very correct bearing may be afterwards obtained from the standard compass.

The intrinsic power of a light should always be considered when expecting to make it in thick weather. A weak light is easily obscured by haze, and no dependence can be placed on its being seen.

The power of a light can be estimated by remarking its order, or candle power, as given in the Light Lists, and in some cases by noting how much its visibility in clear weather falls short of the range due to the height at which it is placed. Thus, a light standing 200 feet above the sea, and only recorded as visible at 10 miles in clear weather, is manifestly of little brilliancy, as its height would permit it to be seen over 20 miles, if of any power. (*See table in Light List before mentioned.*)

The distance from a light cannot be estimated either by its brilliancy or its dimness.

On first making a light from the bridge, by at once lowering the eye several feet and noting whether the light is made to dip, it may be determined whether the vessel is in the circle of visibility corresponding with the usual height of the eye or unexpectedly nearer the light.

9. Fog Signals.—Sound is conveyed in a very capricious way through the atmosphere. Apart from wind, large areas of silence have been found in different directions and at different distances from the fog signal station, in some instances even when in close proximity to it. The apparatus, moreover, for sounding the signal often requires some time before it is in readiness to act. A fog often creeps imperceptibly towards the land, and is not observed by the people at a station until it is upon them; whereas a ship may have been for many hours in it, and approaching the land. In such a case no signal may be made. When sound has to travel against the wind, it may be thrown upwards; in such a case, a man aloft might hear it when it is inaudible on deck. Under certain conditions of the atmosphere, when a fog signal is a combination of high and low notes, one of the notes may be inaudible.

The mariner should not assume—

- a. That, because he fails to hear the sound, he is out of hearing distance.
- b. That, because he hears a fog signal faintly, he is at a great distance from it.
- c. That, because he hears the sound plainly, he is near it.
- d. That, because he does not hear it, even when in close proximity, the fog signal has ceased sounding.
- e. That the distance from and the intensity of the sound on any one occasion, are a guide to him for any future occasion.

Taken together, these facts should induce the utmost caution in closing the land in fogs. The lead is generally the only safe guide.

10. Tides and Tidal Streams.—In navigating coasts where the tidal range is considerable, caution is always necessary. It should be remembered that there are indraughts to all bays and bights, although the general run of the stream may be parallel to the shore.

The turn of the tidal stream off-shore is seldom coincident with the time of high and low water on the shore. In open channels, the tidal stream ordinarily overruns the turn of the vertical movement of the tide by about three hours, forming what is usually known as tide and half-tide, the effect of which is that at high and low water by the shore the stream is running at its greatest velocity.

In crossing a bar or shallow flats, "Table B, for finding the height of tide at any intermediate hour between high and low water," and diagrams given in the Tide Tables, will be found of great assistance in calculating how much the water has risen or fallen at any hour of the tide.

On coasts where there is much diurnal inequality in the tides, the amount of rise and fall can never be depended upon, and additional caution is necessary.

It should also be remembered that at times the tide falls below the level of low-water ordinary springs. This always occurs on the coasts of Europe at the equinoxes, but in other parts of the world, and especially in the tropics, such periodic low tides may coincide more frequently with the solstices. Wind or a high barometer may produce it at any time, and the amount varies with locality. When the moon's perigee coincides with the full or new moon the same effect is often produced.

11. Arrows on charts only show the most usual or the mean direction of a tidal stream or current. It must never be assumed that the direction of a stream will not vary from that indicated by the arrow. In the same manner, the rate of a stream constantly varies with circumstances, and the rate given on the chart is merely the mean of those found during the survey, possibly from very few observations.

12. Fixing Position.—The most accurate method of fixing a position relative to the shore is by angles between well-defined objects on the chart. All ships are supplied with a station-pointer, and this method should be used whenever possible.

Two things are, however, necessary to its successful employment. First, that the objects be well chosen; and, second, that the observer is skilful and rapid in his use of the sextant and station-pointer.

For the former, reference can be made to the pamphlet on the use of the station-pointer, which is in every chart box; the latter is only to be obtained by practice.

It will readily be seen that in war time, when the compass may be knocked away, or gun-fire may make it undesirable to expose the person more than necessary, a sextant offers great advantages, as angles can be obtained from any position whence the objects are visible. It is this contingency that makes it especially desirable that all navigating officers should become expert in this method of fixing a ship's position.

In many narrow waters also, where the objects may yet be at some distance, as in coral harbours or narrow passages among mud banks, navigation by sextant and station-pointer is invaluable, as a true position can only be obtained by its means. A small error in

either taking or plotting a bearing under such circumstances may put the ship ashore.

It is not intended that the use of the compass to fix the ship should be given up; there are many circumstances in which it may be usefully employed, but errors more readily creep into a position so fixed. In all cases where great accuracy of position is desired, angles should invariably be used, such as the fixing of a rock or shoal, or of additions to a chart, of fresh soundings or new buildings. In all such cases angles should be taken to several objects, the more the better; but five objects is a good number, as the four angles thus obtained not only prevent any errors, but they at once furnish a means of checking the accuracy of the chart itself. In the case of ordinary soundings, it is only necessary to take a third angle now and then; firstly, to check the general accuracy of the chart as above stated; secondly, to make certain that the more important soundings, as at the end of a line, are correctly placed.

Sometimes, when only two objects are visible, a compass bearing and sextant angle may be used with advantage.

In passing near a point of land, or an island, the method of fixing by doubling the angle on the bow is invaluable. The ordinary form of it, the so-called "four-point bearing," when the bearing is taken four points on the bow and on the beam, the distance from the object at the latter position being the distance run between the times of taking the two bearings, allowing for current, gives an excellent fix for a departure, but does not ensure safety, as the point and probably the rocks off it are abeam before the position is obtained.

By taking the bearings of two points and four points on the bow, a very good position is obtained before the object is passed; the distance of the latter at the second position being, as before, equal to the distance run in the interval, allowing for current.

This is, however, only strictly true, if the current is directly with or against the course of the ship. If a cross current has to be allowed for, the results by this method may be altogether erroneous and misleading. The following example shows in a tabular form the errors that might be produced by accepting the distance run in the interval, allowing for current, as the distance of the object at time of second bearing.

Example: A vessel steering East sights a light bearing E.N.E., or two points on the bow; one hour after, having run in the interval 10 miles by log, the light bears N.E., i.e., she has doubled the angle on the bow. Current, in all cases, at the rate of 2 miles an hour.

Direction of Current.	Distance run between 1st & 2nd Bearings.		Distance of Light at 2nd Bearing.	Direction of Current	Distance run between 1st & 2nd Bearings.		Distance of Light at 2nd Bearing.
	By Log.	Allowing for Current.			By Log.	Allowing for Current.	
	Miles	Miles	Miles		Miles	Miles	Miles
East . . .	10	12	12	West . . .	10	8	8
E.N.E. . .	10	11·8	10	W.S.W. . .	10	8·2	10·2
N.E. . . .	10	11·4	8	S.W. . . .	10	8·7	11·9
N.N.E. . .	10	11	6·2	S.S.W. . .	10	9·4	13·6
North . . .	10	10·2	5·3	South . . .	10	10·2	14·7
N.N.W. . .	10	9·4	4·9	S.S.E. . .	10	11	15
N.W. . . .	10	8·7	5·3	S.E. . . .	10	11·4	14·7
W.N.W. . .	10	8·2	6·1	E.S.E. . .	10	11·8	13·8

The following rule should be observed in all cases of a cross current, viz. :—

When the angle between the second bearing and the course made good (over the ground) is double the angle between the first bearing and the course made good (over the ground) the distance from the object is equal to the distance made good (over the ground) between the times of the first and second bearings.

To get a reliable result the difference between the first bearing and the course made good (over the ground) should never be less than 20° . It follows, therefore, that it is necessary, before observing the first bearing, to decide upon the course being made good (over the ground). This may be done as follows, viz. :—

From any point, A, on the chart draw a line A B, representing by its direction the course steered and by its length the speed through the water. From the point B, draw another line, B C, representing in a similar manner the estimated direction and rate of the current, &c., to be allowed for. Then a line joining the points A and C will represent in the same manner the course and speed which are being made good (over the ground).

A table of factors, by which to multiply the distance run, to obtain the distance of the object when any number of degrees between the two bearings has been observed, is supplied with all chart sets.

The use of a danger angle in passing outlying rocks with land behind should also not be forgotten. In employing this method, however, caution is necessary, as should the chart be not accurate, i.e., should the objects selected be not quite correctly placed, the angle taken off from it may not serve the purpose. It should not, therefore, be employed when the survey is old or manifestly imperfect.

In fixing by the compass, it must always be remembered that two bearings only are liable to error. An absolute error may be made in either bearing observed; errors may be made in applying the deviation; or errors may creep in in laying them on to the chart. For these reasons, a third or check bearing of some other object should be taken, especially when near the shore or dangers. The coincidence of these three lines will prevent any mistakes.

Amongst astronomical methods of fixing a ship's position, attention is drawn to the great utility of Sumner's method. A Sumner line, that is, a line drawn through the position (obtained by an assumed latitude or longitude) at right angles to the bearing of the sun, as obtained from the azimuth tables, gives at times invaluable information, as the ship must be somewhere on that line, provided the chronometer is correct. A deep cast of the lead at the same time may often serve to give an approximate position on the line. An early and very accurate position can also be obtained by Sumner's method, by getting a Sumner line by a bright star at daylight when the horizon is well visible, and another Sumner line by the sun when a few degrees above the horizon, or, better still, by observing two or more stars at twilight. The Sumner lines thus obtained will, if the bearing of sun and star differ three points or more, give an excellent result.

13. Change of Variation of the Compass.—The gradual change in the variation must not be forgotten in laying down positions by bearing on charts. The magnetic compasses placed on the charts for the purpose of facilitating plotting become in time slightly in error, and in some cases, such as with small scales, or when the lines are

long, the displacement of position from neglect of this change may be of importance. The compasses are re-engraved when the error amounts to a quarter of a point, but the chart plates cannot be corrected more frequently from the impossibility of making alterations often on one spot in a copper plate.

The geographical change in the variation is in some parts of the world sufficiently rapid to need consideration. For instance, in approaching Halifax from Newfoundland the variation changes 10° in less than 500 miles, and in the English Channel about 5° in 400 miles. The Variation Chart should be consulted on this head.

On certain general charts embracing large areas with considerable change of variation, True compasses are placed instead of magnetic compasses, the variation being shown by *isogonic lines* (curves of equal magnetic variation), in a similar manner to the Variation Chart. One or two *isogonic lines* are also sometimes placed on charts, in addition to the magnetic compasses, in order to indicate the general direction of these curves, and thus facilitate the determination of the variation to be employed in portions of the chart not in immediate proximity to any one of the engraved compasses.

14. Local Magnetic Disturbance of the Compass on board Ship.—The term "local magnetic disturbance" has reference only to the effects on the compass of magnetic masses external to the ship in which it is placed. Observation shows that such disturbance of the compass in a ship afloat is experienced only in a few places on the globe.

Magnetic laws do not permit of the supposition that it is the visible land which causes such disturbance, because the effect of a magnetic force diminishes in such rapid proportion as the distance from it increases that it would require a local centre of magnetic force of an amount absolutely unknown to affect a compass half a mile distant.

Such deflections of the compass are due to magnetic minerals in the bed of the sea under the ship, and when the water is shallow, and the force strong, the compass may be temporarily deflected when passing over such a spot, but the area of disturbance will be small, unless there are many centres near together.

It is very desirable that whenever a ship passes over an area of local magnetic disturbance, the position should be fixed, and the facts reported as far as they can be ascertained.

15. Use of Oil for Modifying the Effect of Breaking Waves.—Many experiences of late years have shown that the utility of oil for this purpose is undoubted, and the application simple.

The following may serve for the guidance of seamen, whose attention is called to the fact that a very small quantity of oil, skilfully applied, may prevent much damage both to ships (especially the smaller classes) and to boats, by modifying the action of breaking seas.

The principal facts as to the use of oil are as follows:—

1. On free waves, *i.e.*, waves in deep water, the effect is greatest.
2. In a surf, or waves breaking on a bar, where a mass of liquid is in actual motion in shallow water, the effect of the oil is uncertain, as nothing can prevent the larger waves from breaking under such circumstances; but even here it is of some service.
3. The heaviest and thickest oils are most effectual. Refined kerosene is of little use; crude petroleum is serviceable when nothing

else is obtainable; but all animal and vegetable oils, such as waste oil from the engines, have great effect.

4. A small quantity of oil suffices, if applied in such a manner as to spread to windward.

5. It is useful in a ship or boat, both when running, or lying to, or in wearing.

6. No experiences are related of its use when hoisting a boat up in a sea-way at sea, but it is highly probable that much time and injury to the boat would be saved by its application on such occasions.

At anchor, when the sea is sufficient to render it difficult to hoist up or in boats, oil bags from forward or from the swinging booms have been found to render the sea alongside comparatively smooth.

7. In cold water, the oil, being thickened by the lower temperature, and not being able to spread freely, will have its effect much reduced. This will vary with the description of oil used.

8. The best method of application in a ship at sea appears to be: hanging over the side, in such a manner as to be in the water, small canvas bags, capable of holding from one to two gallons of oil, such bags being pricked with a sail needle to facilitate leakage of the oil.

The position of these bags should vary with the circumstances. Running before the wind they should be hung on either bow—*e.g.*, from the cathead—and allowed to tow in the water.

With the wind on the quarter the effect seems to be less than in any other position, as the oil goes astern while the waves come up on the quarter.

Lying to, the weather bow and another position farther aft seem the best places from which to hang the bags, with a sufficient length of line to permit them to draw to windward, while the ship drifts.

9. Crossing a bar with a flood tide, oil poured overboard and allowed to float in ahead of the boat which would follow with a bag towing astern, would appear to be the best plan. As before remarked, under these circumstances the effect cannot be so much trusted.

On a bar with the ebb tide it would seem to be useless to try oil for the purpose of entering.

10. For boarding a wreck, it is recommended to pour oil overboard to windward of her before going alongside. The effect in this case must greatly depend upon the set of the current, and the circumstances of the depth of water.

11. For a boat riding in bad weather from a sea anchor, it is recommended to fasten the bag to an endless line rove through a block on the sea anchor, by which means the oil is diffused well ahead of the boat, and the bag can be readily hauled on board for refilling if necessary.

12. Towing a vessel in a heavy sea, oil is of the greatest service, and may prevent parting the hawser. Distribute from the towing vessel forward and on both sides; if used only aft the tow alone gets the benefit.

16. *Concise Rules for Revolving Storms:—*

1. Revolving storms are so named because the wind in these storms revolves round an area of low pressure situated in the centre. They have also local names, and are termed hurricanes in the West Indies and South Pacific Ocean; Cyclones in the Indian Ocean, Bay of Bengal, and Arabian Sea; and typhoons in the China Sea.

2. In these storms the wind always revolves the same way in the same part of the world, that is, against the movement of the hands of a watch in the northern hemisphere, and with the hands of a watch in the southern hemisphere. The wind does not revolve in circles, but has a spiral movement, inwards, towards the centre.

3. Revolving storms have also, as a general rule, a progressive movement. Within the tropics they usually move from east to west at first, and then curve towards the pole of the hemisphere in which the storm is generated, and afterwards move from west to east.

4. The track which the centre of the storm takes is called the path of the storm, and the portion of the storm-field on the right of the path is known as the right-hand semicircle, and that on the left as the left-hand semicircle of the storm.

5. In the right-hand semicircle, if the observer be stationary, the wind will always shift to the right, and in the left-hand semicircle to the left. This law holds good in both hemispheres.

6. If a vessel be so situated in a storm that running before the wind the path of the advancing storm will be crossed, this is considered to be the dangerous semicircle. This will always be the right-hand semicircle in the northern hemisphere, and the left-hand in the southern.

7. These storms are most frequent in the northern hemisphere from July to November, and in the southern hemisphere from December to May. In the Bay of Bengal and Arabian Sea they, however, occur most frequently about the time of the change of the monsoon.

8. The area over which revolving storms have been known to extend varies in diameter from 20 miles to some hundreds of miles, and their rate of movement in the West Indies averages about 300 miles a day; in the China Sea, Bay of Bengal, and Arabian Sea about 200 miles a day; and in the Indian Ocean from 0 to 200 miles a day, the more stationary storms occurring at the beginning and end of the Hurricane season.

9. The indications of the approach of a revolving storm are (1) an unsteady barometer, or even a cessation in the diurnal range, which is constant in settled weather; (2) a heavy swell not caused by the wind then blowing; (3) an ugly, threatening appearance of the sky.

10. In order to judge what is the best way to act if there is reason to believe a storm is approaching, the seaman requires to know (a) in which direction the centre of the storm is situated, (b) in which semicircle the ship is situated.

11. As these points cannot be determined if a vessel is moving with any speed through the water, the first proceeding should be to "stop" or "heave to," and, as it is always best to assume, at first, that the vessel may be in the dangerous semicircle, she should be hove to on the starboard tack in the northern hemisphere, and on the port tack in the southern.

12. If an observer faces the wind the centre of the storm will be from 12 to 8 points on his right hand in the northern hemisphere, and on his left hand in the southern hemisphere; 12 points when the storm begins; about 10 points when the barometer has fallen three-tenths of an inch, and about 8 points when it has fallen six-tenths of an inch or upwards.

13. If the wind shifts to the right the vessel is in the right-hand semicircle, if to the left in the left-hand semicircle, and, if the wind

is steady in direction, but increasing in force, she is in the direct path of the storm.

14. If the seaman has reason to think that his vessel is in the direct path of the storm he should run with the wind on the starboard quarter in the northern, and on the port quarter in the southern, hemisphere until the barometer has ceased falling. If she is in the right-hand semicircle in the northern hemisphere she should remain hove to on the starboard tack, but if in the southern hemisphere run with the wind on the port quarter; if she is in the left-hand semicircle in the northern hemisphere she should run with the wind on the starboard quarter, but if in the southern hemisphere remain hove to on the port tack.

15. Should a vessel not have sufficient room to run when in the least dangerous semicircle, she should heave to on the port tack in the northern, and on the starboard tack in the southern, hemisphere.

16. If in a harbour or at anchor the seaman should be just as careful in watching the shifting of the wind and ascertaining the direction of the centre, as by so doing he will be able to tell on which side of the path of the storm he is situated, and be able to act according to circumstances.

17. Should the centre of a storm pass over a vessel, the wind, after blowing furiously in one direction, ceases for a time, and then blows with equal fury from the opposite direction. This makes a confused pyramidal sea, which is especially dangerous.

**IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.**

**THE LATITUDES AND LONGITUDES GIVEN IN THE
TEXT ARE APPROXIMATE.**

**THE VARIATION GIVEN IN THE SEVERAL PAGES IS
FOR THE YEAR 1911.**

THE BEARINGS OF LIGHTS ARE GIVEN FROM SEAWARD.

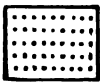
**THE DISTANCES ARE EXPRESSED IN SEA MILES OF
60 TO A DEGREE OF LATITUDE.**

**A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO 100
FATHOMS, OR THE TENTH PART OF A MILE.**

**THE SOUNDINGS ARE REDUCED TO LOW WATER OF
ORDINARY SPRING TIDES.**

**HEIGHTS ON THE LAND ARE GIVEN ABOVE HIGH WATER
OF ORDINARY SPRING TIDES.**

**WHEN SHADING IS USED TO INDICATE COLOURS OF
FLAGS OR BEACONS, IT IS AS FOLLOWS:**



Yellow.



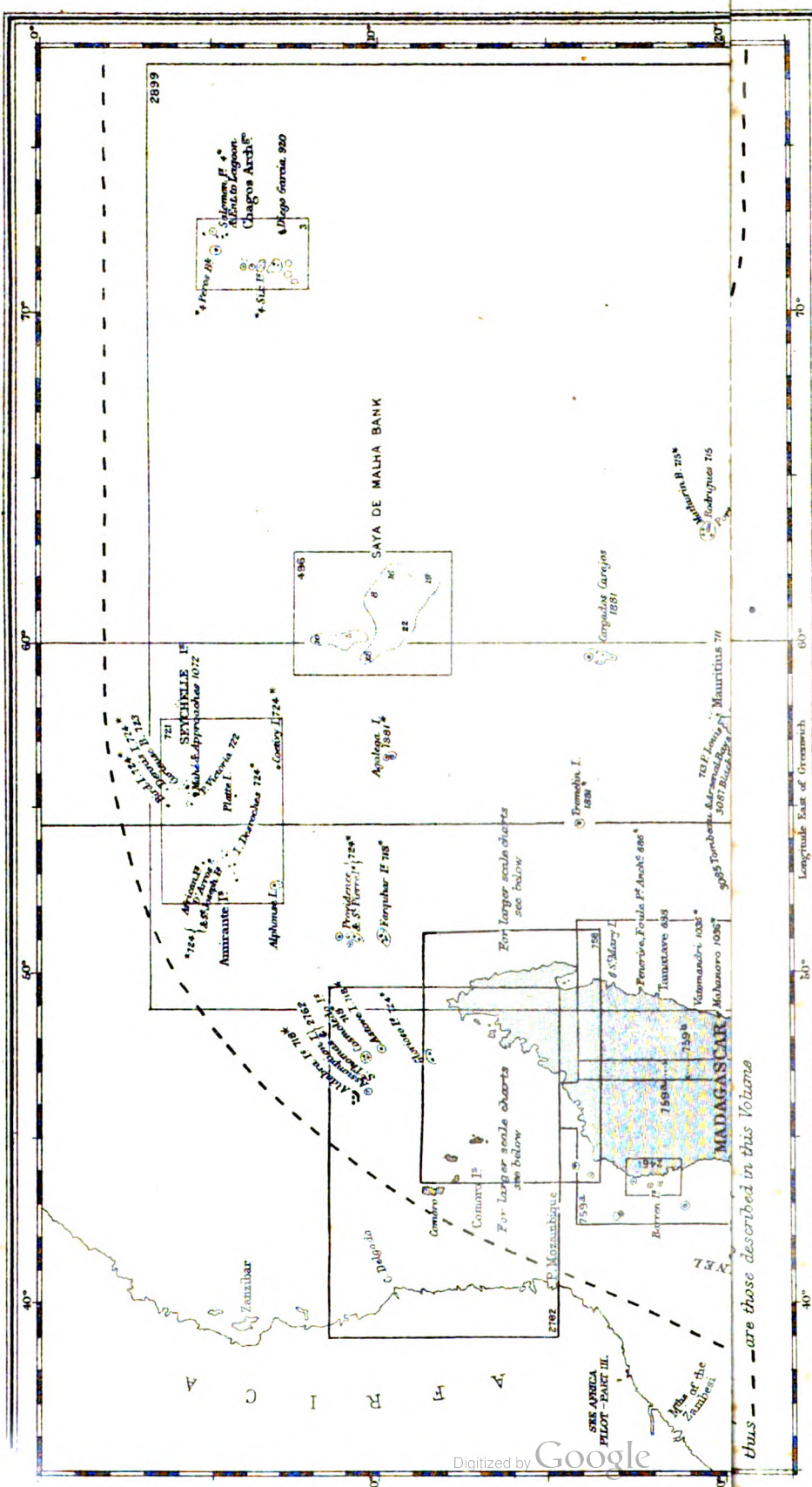
Red.



Blue.



Black.



thus -- -- are those described in this Volume

SEE AFRICA PILOT - PART III.

of the East India

Longitude East of Greenwich

Corrected to January 1912.

Engraved by Davies & Company

For details of sectors and the latest information respecting the Lights which are included in this work, seamen should consult the Admiralty List of Lights, Part VI. This List is published early in every year, corrected to the preceding 31st December.

For details of sectors and the latest information
regarding the rights which are included in this
work, consult the table of contents. This list of
rights is in this table is published every in every
year, according to the procedure and procedure.

SOUTH INDIAN OCEAN PILOT,

FOR THE

ISLANDS WESTWARD OF LONGITUDE 80° EAST,

INCLUDING

MADAGASCAR AND THE COMORO ISLANDS.

CHAPTER I.

ISLANDS AND GROUPS. — WINDS, GALES, ETC. — CYCLONES. —
BAROMETER.—THERMOMETER.— ICE.— CURRENTS.—DOCKS.—
COAL.—COMMUNICATIONS.—TIME.—PASSAGES.

Charts 748a, b.

PRINCIPAL ISLANDS AND GROUPS.—The Southern Indian Ocean westward of long. 80° E., and extending southward to the Antarctic regions, contains within these limits the following principal islands and groups, viz., Madagascar, said to be the fourth largest island in the world:—eastward and north-eastward of Madagascar, at from 350 to 780 miles from its shores, are the large islands of Réunion, Mauritius, and Rodriguez; the Cargados Carajos group; the extensive Saya de Malha bank; and the Seychelles and Amirante groups. Nearer the northern end of Madagascar, and within these outer islands, are the Farquhar and other smaller groups and islands of less importance; and in the northern entrance to the Mozambique channel are the Comoro islands.

Nearly 1,000 miles eastward of the Seychelles group, between the parallels 4° 44' and 7° 39' S., and the meridians 70° 50' and 72° 44' E., is that vast accumulation of islands and coral reefs comprising the Chagos archipelago; this group, with nearly the whole of Madagascar, and all the islands and groups previously mentioned, lie within the Tropic of Capricorn.

Farther southward, between the parallels 37° 50' and 38° 50' S., in long. 77° 30' E., and in the track of sailing vessels bound to Australia

Charts 748a, b.

or to the Straits of Sunda, are the little precipitous islands of St. Paul and Amsterdam. Still farther South, and though occasionally sighted by outward-bound vessels, well southward of tracks recommended for any Australian or other port, and at wide intervals from each other, are the Prince Edward islands, Crozet islands, and Kerguelen island; with Heard and McDonald islands yet farther South.

Of the islands and groups mentioned, a few introductory remarks may be useful before proceeding to a description of the winds, currents, and other phenomena affecting the large area under consideration.

MADAGASCAR, since 1896 declared to be a French colony, and ruled by a Governor General, is separated from Africa by the Mozambique channel, which is from 560 to 220 miles wide. It lies between the parallels $11^{\circ} 57'$ and $25^{\circ} 39'$ S., and the meridians $43^{\circ} 10'$ and $50^{\circ} 30'$ E. It is about 860 miles long N.N.E. and S.S.W., and its greatest width is 300 miles. Its area, with its dependencies, is about 226,016 square miles, or four times the size of England and Wales. The capital is Antananarivo, a city with 72,000 inhabitants, and the total population of the island, which was formerly estimated at from 5,000,000 to 6,000,000, was, by the census of 1906, 1909, 1910, 2,921,476.

The physical and historical conditions of this large and important island, together with its products, customs, and industries will be found described in Chapter VI., whilst the description of its coastline, ports, &c., commences in that, and occupies the four following chapters.

The Comoro islands, which are a dependency of Madagascar, are described in Chapter V., and the Glorioso islands, also under the same Government, are described in Chapter VIII.

Réunion, Mauritius, Rodriguez, &c.—Réunion, described in Chapter IV., is French, and, like all French possessions in this ocean, is a dependency of Madagascar. Mauritius is described in Chapter III. and is the principal British island in this ocean, and the seat of government of the islands described in that chapter, as well as Coetivy island, Agalega islands, and the Chagos archipelago, described in Chapter II., and the Farquhar islands, described in Chapter V., they being attached to it as dependencies; it has an area of 713 square miles, about the same as Réunion, and is valuable to shipping from its capacity for repairs. Rodriguez is only 10 miles long by 5 miles wide, but has one fairly good harbour; it lies about 320 miles eastward of Mauritius. The low islets of the Cargados Carajos group are permanently inhabited, and are used as a fishing station for Mauritius, from which they lie about 220 miles in a N.E. by N. direction. About 1,000 miles north-eastward of this group lies the Chagos

Charts 748a, b.

archipelago, of which by far the most important island is Diego Garcia, the southernmost of the group.

Seychelles islands.—The principal islands of this group are high and volcanic, but they are surrounded by very extensive coral reefs and islets; they, with the Amirante group, Providence group, Cosmoledo group, Aldabra group, and many other islands in the neighbourhood before mentioned, are British, and form the colony of Seychelles, under the governor, who resides in Mahé, the principal island; they will be found described in Chapter II. and V.

For descriptions of St. Paul and Amsterdam islands, and for the still more remote southern islands of Prince Edward, Crozet, Kerguelen, &c., the reader is referred to Chapter XI.

CORAL ISLANDS and REEFS.—Definitions.—Coral formations being very prevalent in the Indian Ocean, it may be useful to give shortly the names and peculiarities of the various forms of coral structure as usually understood.

An Atoll may comprise one or any greater number of coral islands of little height, situated on a strip or ring of coral surrounding a central lagoon. Many atolls have passages through this ring of sufficient depth to admit ships to a secure sheltered anchorage within. In others, the passages will scarcely admit boats, and in others the ring is without an opening. A small atoll on the edge of a larger one is termed an Atollon. Most of the islands in the Pacific Ocean are of atoll formation, as are also many of those in the Indian Ocean, especially in the Laccadive, Maldivé, and Chagos groups.

A Barrier reef may front a coastline, or encircle an island or group of islands leaving a deep channel between it and the shore. The Great Barrier reef of Australia is an example of the former, and that surrounding the island of Tahiti, in the Pacific, of the latter. Barrier reefs thus form natural breakwaters, with passages through them, frequently, leading into good harbours; these passages are generally found opposite valleys in the land, sheltered by the reef. Tidal streams and currents are generally strong and uncertain in these barrier openings.

A Fringing reef is a coral reef extending from the shore, seldom very far, with but little water over it, and no ship passage between it and the land. As the seaward face of these reefs is generally the highest part, on some of them the tide becomes more or less impounded, facilitating navigation by canoes or boats at low water in the narrow passages which generally exist. A coastline with a fringing reef has frequently a barrier reef also, with a deep passage between the two. Madagascar has examples of barrier reefs and still

more frequently of fringing reefs. Of the latter, perhaps the island of Rodriguez is as good a sample as any island in the Indian Ocean.

NAVIGATION amongst Coral reefs.—As successful navigation amongst coral reefs depends largely upon the eye, it is well to name the conditions under which reefs are most easily seen:—Thus, they are always more plainly visible from the masthead than from the deck or bridge, and when the sun is high rather than low; as also, with the sun behind the observer rather than facing it. With the sea glassy calm, it is extremely difficult to distinguish reefs.

The best conditions, therefore, are, with the sun high and behind the observer, and the sea ruffled by a pleasant breeze. Banks, with about 3 feet water over them, then appear of a light brownish colour; those with a fathom or more, of a clear green, deepening to a darker green as the water increases in depth, and finally to a deep blue when out of soundings.

Under favourable circumstances, a bank with 3 or 4 fathoms over it can be seen from aloft at a good distance; but where, and in proportion, as the depths increase beyond this, the bottom will only be seen when nearly over it.

WINDS.*—The general wind system of any large area can only be explained by the aid of a comprehensive knowledge of the barometric pressure prevailing not only over the area in question, but, generally over adjacent areas; and, before proceeding to a description of the winds of the Southern Indian Ocean, it may be well to state shortly the laws governing the relation of wind to barometric or atmospheric pressure. Of these, the primary fact is that where atmospheric pressure, from whatever cause, falls below its average, *i.e.*, where there is a deficiency of air, an impulse is given for an in-flow of air from any adjacent locality where there exists an area of high pressure, or in other words, where there is a surplus of air.

The strength of the air current or wind caused by these conditions will naturally depend on whether the difference of pressure between centres of high and low pressure areas, as also their distances apart, are great or of but slight proportions; and the movement of the air current will not as a rule be directly towards the low-pressure centre, but with an in-moving spiral rotary motion round it.

In North latitudes, the spiral in-flowing movement of the air round areas of low pressure is always in the opposite direction to the motion of the hands of a watch placed face upwards; in South latitude it is

* See Admiralty wind charts, Nos. 2,931 to 2,934; also, Meteorological charts of Southern Ocean between Cape of Good Hope and New Zealand, published by the Meteorological Office, London.

Wind charts, Pacific, Atlantic, and Indian Oceans.

the exact reverse ; in each case the motion is called cyclonic. Around areas of high pressure the air also circulates, but with an out-flowing tendency and always, in each hemisphere, in the opposite direction to the cyclonic motion ; hence, this motion is known as anti-cyclonic.

Indian Ocean.—North of the Equator, the winds of the Indian Ocean are characterised chiefly by the periodical changes known as the North-east and South-west monsoons ; *monsoon* being an Arabic word signifying *season*. At the times of change from one monsoon to the other, there is an interval of unsettled weather, with variable winds and squalls. Southward of the zone occupied by the monsoons, there is a space where variable winds and squalls prevail, sometimes called South-east and North-west monsoons, until arrived within the zone of the regular South-east trade wind, which blows all the year round. Southward of the trade wind there are again variables until steady westerly winds are found, while still farther South they again become variable.

Monsoons.—The winds to which the name of monsoon was originally applied, extend from the Equator to the Tropic of Cancer, embracing all the northern part of the Indian Ocean. The North-east monsoon blows, with some variation, from October to March inclusive, and is the period of fine weather. The South-west monsoon blows from April to September, bringing rain and bad weather ; this wind is stronger than the North-east monsoon, and raises a heavier sea.

The South-east Trade wind blows throughout the year from the western side of Australia to within a few degrees of the eastern side of Madagascar ; it is most regular while the sun is near the Tropic of Cancer, and its limits lie between the parallels 4° and 20° or 25° S. during the South-west monsoon of the northern hemisphere—that is, from April to September inclusive ; and between 10° and 30° S. during the North-east monsoon—from November to the end of March.

During the first period, when the South-west monsoon is blowing, the direction of the trade wind continues between E.S.E. and S.E. ; but from October to April it is more frequently to the northward of East, and often varies as far as N.E. and sometimes even to N.W. When from the latter direction, the breeze is in general unstable, and often broken by calms or gales ; and it is nearly always accompanied by rain or squally weather, with lightning.

South-east and North-west Monsoons.—In the intermediate space between the North-east monsoon and the South-east trade wind, westerly winds will be found during the season of the former, varying from North-west to South-west ; and the contrary during the latter. From the analogy which these winds bear to the

Wind charts, Pacific, Atlantic, and Indian Oceans.

regular monsoons they have received a similar designation, as their occurrence periodically coincides sufficiently with the return of the seasons, though they are far from having a character for fixity so defined as that of the two great monsoons. The zone occupied by them extends eastward of the Seychelles, and southward of the Equator as far as 10° S. in the Indian Ocean, and to 20° or 23° S. eastward of that ocean as far as the New Hebrides. During the months when the N.W. monsoon prevails, the zone comprised within the limits assigned to equatorial calms is rather a zone of calms and variable winds. The constancy of the N.W. monsoon is not to be relied on except in the months of December and January, and when eastward of the meridian 58° E., also between lats. 2° or 3° N. and 10° or 12° S.

Variable winds.—Southward of the trade wind zone there is an area of variable winds and calms; of this region it may be remarked that an area of high barometric pressure lies between the African Continent and Australia throughout the year, that it alters in position slightly from month to month, and that, generally, the centre of this area lies more to the East and South from November to April, the summer months, than at any other times. Consequently in the winter months, when this high pressure area is farthest North, winds from a westerly quarter prevail.

As the high pressure area moves southward, the wind in the neighbourhood of lat. 30° S. becomes more variable. By December, however, winds from an easterly quarter increase in frequency, and in the first three months of the year become the prevailing winds between lats. 30° and 36° S., and as north-easterly winds are experienced off the African coast in all months, this is the best season for making a homeward voyage round the Cape of Good Hope.

The Roaring Forties.—Southward of lat. 35° or 36° S. the wind, though subject to great variation both in force and direction, is generally from a western quarter, and in proceeding still farther South, to the 40th parallel or beyond, assumes such strength as to have acquired amongst seafaring people the title of the Roaring Forties; and it was formerly thought that between lats. 40° and 50° S. the wind was constant from the westward. Modern investigation has, however, shown that this is not the case, the winds in these latitudes being of cyclonic character, thus:—

The cyclonic areas are large, with a progressive eastward movement, and the central depression generally southward of lat. 45° S.; the wind in the northern semicircle, therefore, commencing between North and N.W., may be expected to shift to the westward, freshening as it does so, and frequently flying rather suddenly to the south-westward, from which quarter in all probability will be the strongest blow, with a

Wind charts, Pacific, Atlantic, and Indian Oceans.

rising barometer. A vessel steering eastward will therefore hold a fair wind for a longer or shorter time in proportion as her own speed agrees with or is less than the progressive motion of the cyclonic system she is in. When the progress of the latter is not much faster than the rate of sailing of the ship, she may carry a westerly wind with her for many days; and, after losing the benefit of one system, will probably, after a day or two of light variable winds, be overtaken by another and repeat the process.

In accordance with the well-known cyclonic law as to the wind being strongest as the centres of depressions are approached, and most rapid in its changes of direction, it follows that a vessel in about lat. 40° S. may expect more steady westerly winds and less sea than if farther South. Hence this parallel is recommended as the best for making easting when proceeding either to Mauritius, India, China, or Australia. As a shortening of distance is effected by an approximation to the great circle track in a passage to Australia, vessels sometimes adopt it, but frequently at the cost of much straining to the ships and anxiety to their captains.

Should the area of lowest depression of any system be farther northward than usual, and thus northward of a ship's track, which is occasionally but not often the case if the 40th parallel be adhered to, the wind will shift to the eastward instead of to the westward, and a hard easterly or south-easterly gale will probably be experienced; this is of course much more likely to occur in adopting the great circle route than in running along the 40th parallel.

Calms.—When the South-west monsoon is well established in the northern hemisphere, calms are very rare in the vicinity of the Equator, and vessels pass from that monsoon into the trade wind without the intermediate calm. Nevertheless, about the meridian of the Seychelles, between lats. 1° and 2° N., the mariner may expect to find a zone of separation from 40 to 60 miles wide, characterised by violent squalls from the southward or eastward; southward of that zone the wind becomes settled from South or S.S.E.

In the Indian Ocean, generally, the following regions will be found specially liable to calm:—Northward of a line joining the southern point of India and the northern point of Sumatra, and along the south-western side of that island to the southward of the straits of Sunda. Also, north-westward of a line from the southern point of India to Zanzibar, and near the East coast of Africa as far as 5° or 15° S. Calms reach the southern limit when the sun has southern declination; during the other half year, including April and September, the zone is more contracted and calms less frequent.

Wind charts, Pacific, Atlantic, and Indian Oceans.

Fog is not common in the Indian Ocean when clear of the land until southward of the trade wind zone; but southward of lat. 40° S., wherever the range of sea surface temperature is great there fog is of frequent occurrence, amounting to as much as 10 per cent. of observations recorded.

Winds near Madagascar.—The existence of this large island with its high mountain ranges greatly modifies the aerial system in this part of the Indian Ocean, making it necessary that the locality should be separately considered.

N.E. and East coast.—The South-east trade wind, which is, as before described, constant in the eastern part of the ocean, does not reach the eastern coast of Madagascar; but on that side of the island periodical winds, called monsoons, blow with moderate force.

The N.E. monsoon, from October to April, is irregular; very variable winds or calms are experienced everywhere from Cape Amber, the northern point of the island, to Fort Dauphin, near the southern end, especially in January, February, and March. Gales are frequent after December, sooner or later according to the year.

In April, the South-east monsoon commences rather suddenly, soon attaining regularity and force. At the end of the fine season, on the contrary, the south-easterly winds modify their direction slowly and intermittingly.

S.E. coast.—On the south-eastern coast of Madagascar, from March to September, north-easterly winds prevail, though at the same time south-easterly winds are felt northward of the parallel 22° S. The line of demarcation between those two winds is generally in about $22^{\circ} 35'$ S. Southward of that line, the land wind springs up in the morning, and, after passing through North, becomes fixed between N.E. and East about 10 or 11 a.m. It blows fresh in the afternoon, moderates in the evening, and falls calm at night, to recommence off the land in the morning. This regularity sometimes continues for twelve or fifteen days, when it may be interrupted by breezes varying between South and East, sometimes of great strength but of short duration.

On this coast, between September and December, winds varying between South and East become more frequent, but have less strength than at the former period, and have a tendency to change from South to West. December and January are characterised by rainy weather and strong winds, generally from the westward, of moderate force between the frequent squalls, and otherwise not dangerous, being generally off-shore. In February and March there is less rain and the wind turns more frequently from South to East; sometimes it is

Wind charts, Pacific, Atlantic, and Indian Oceans.

violent, especially towards the end of March, which is the most dangerous time on this coast.

South coast.—The prevailing winds near this coast from April to November are between East and South ; it blows fresh along the coast nearly every day, from 10 a.m. until 7 or 8 p.m., then moderates and draws more off the land. Sometimes it blows for three or four days without the land wind occurring, but with less force during the night ; in that case it generally holds more from the South than from the East. At 12 or 15 miles off-shore, the land wind is in any case very weak. These winds are interrupted at long intervals by moderate breezes from West or South-west. Near Cape St. Mary the wind generally inclines from South to West.

From November to March, the winds are more changeable both in force and direction, and often blow from between South and West. In December and January gales are frequent. In February and March violent squalls may be expected, shifting from West through South to East.

About December and January, westerly winds often blow for many days consecutively between the southern end of Madagascar and Réunion.

Mozambique channel.—The winds in this channel depend on those of the Indian Ocean and Arabian Sea. The seasons are distinguished as those of the Northern and Southern monsoons, but the winds do not blow with the same regularity as farther North, and gradually lose the character of monsoons altogether in proceeding southward. The Northern monsoon commences between mid-September and mid-October, and does not extend farther South than about the parallel of 20° S. The Southern monsoon begins between mid-March and mid-April. The change of season is generally accompanied by squally weather.

In the northern part of the Mozambique channel, at the end of the Southern monsoon, the direction of the wind changes gradually to the left until the Northern monsoon becomes established in the end of October, but it is really only during the months of November and December that the prevalence of north-easterly winds deserves the designation of monsoon, and even then winds from the western quarter are not rare. Towards the end of December, the monsoon becomes strong ; for three consecutive years the first decided blow was observed to occur at the Comoro islands on the 25th December. It continues with some force until about the beginning of February, at which time, in the southern part of the channel, the southerly wind begins to make itself felt, and about the end of February it is established, though not with any force until April.

Wind charts, Pacific, Atlantic, and Indian Oceans.

Near the Mozambique coast, from and after December, calms, variables, and rain are met with; though in mid-channel it is usually fine with a fresh breeze. During the Northern monsoon, the southerly wind prevailing at the southern end of the channel often amounts to a gale, producing a considerable sea; such winds commonly force their way northward, overcoming the monsoon even as far North as the Comoro islands, and blow with the force of a double-reef topsail breeze. This weather does not last long, but is preceded by heavy banks of cloud to the southward, with gloomy weather.

The Southern monsoon blows from S.S.E. to S.S.W. between Europa island and the Comoro group, attaining its greatest westing in May and June; from July it gradually shifts to the eastward; in September and to November, calms and light winds are prevalent until the Northern monsoon is again established. The Southern monsoon is called the fine weather season, and is generally free from gales; but there is much more wind and sea at this time in the Mozambique channel than during the Northern monsoon; vessels proceeding to the southward will frequently find a hard double-reef topsail breeze and a heavy sea.

On the coast of Madagascar, land and sea breezes prevail; the former being very light and lasting from about midnight to noon; the sea breeze generally sets in during the afternoon, increasing in force until sunset, when it subsides and gradually dies away towards midnight, followed by the land wind. In the evening, within 20 miles of the coast, lightning and thick banks of clouds are common, having a threatening appearance but generally harmless.

At the Comoro islands, the Southern monsoon sets in about the beginning of April, when heavy squalls from the westward and much rain may be expected; from thence, the monsoon makes its way up the African coast.

Calms.—During the Northern monsoon the frequency of calms is about 25 per cent., and in the Southern monsoon 10 per cent. In November they are most prevalent, being about three times as many as in June. The Madagascar coast is most subject to them. They are most common all the year round northward of the 20th parallel. Southward of that, and as far as the 25th parallel, they are rare during the Southern monsoon, but farther southward they are more common during the Southern than in the Northern monsoon.

Gales.—The Mozambique channel is, at times, subject to hard gales and severe weather, besides an occasional cyclone. These gales generally occur during the Northern monsoon, and mostly begin by the monsoon freshening to a force of 6 or 7; it then slackens, with a steady barometer and the wind shifts rapidly through West and finally sets

Wind charts, Pacific, Atlantic, and Indian Oceans.

in as a violent gale from South to S.W. Occasionally the wind shifts through East. At times the steep gradients are to the eastward, when the northerly wind remains steady in direction but increases to a violent gale. The approach of these gales is generally foretold by a threatening sky to the westward, with lightning: sometimes they occur after several days calm.

CYCLONES.—For 10 months of the year, but especially from November to May inclusive, the southern part of the Indian Ocean, within and just southward of the tropic, is subject to hurricanes or cyclones, which take their rise between 6° and 16° S., and travel at first in a W.S.W. direction, curving gradually to S.S.W. and South until they reach the parallel of about 25° S., when they curve still more to the left, finally assuming a south-easterly course. Sometimes they strike the coast of Madagascar before turning to the South-east, chiefly between Cape East and Matitanana, but very seldom southward of Mananzari and not often northward of Cape East; their direction is then arrested by the high land of that island.

At Seychelles cyclones are of rare occurrence; they generally pass about 200 miles southward of Mahé. Only one cyclone is known to have passed over the Chagos archipelago, that of January, 1891. One only, but that a very violent one, is recorded at Zanzibar in April, 1872; and in October, 1906, the French cruiser *Alger* passed through the centre of a very violent cyclone in lat. $10^{\circ} 50'$ N. and long $58^{\circ} 50'$ E., which is the only one recorded in this neighbourhood, except for one in June, 1885, between 1873 and 1908.

On this coast, therefore, the premonitory signs of a cyclone may be observed without the storm following, the western trajectory having passed over or near Mauritius or Réunion and then turned southward and south-eastward without impinging upon the coast of Madagascar, but giving notice of its vicinity both by an unusual fall of the barometer and by the formation of heavy rollers on the shore. These rollers sometimes occur during the fine season, as the result of a distant gale at sea when fine weather prevails on the coast; but during the other season, their occurrence must be considered with other premonitory symptoms of disturbance, and, between December and April, they may be regarded as almost certain harbingers of approaching bad weather.

Rollers are not often felt northward of Antongil bay in Madagascar, but at the islands of Réunion, Mauritius, and Rodriguez they rise to a great height and break violently on the shores.

Cyclones are occasionally experienced in the Southern Indian Ocean during the months of June, July, and October, as shown in the following table, but appear to be unknown during August and Septem-

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ber. Observations during a period of 35 years, ending with 1890, give the following results:—

(From Dr. Meldrum, Director of the Government Observatory,
Mauritius.)

Months.	Total Number.	Progressive.	Stationary.	Percentage of Stationary Gale.	Months.	Total Number.	Progressive.	Stationary.	Percentage of Stationary Gale.
January -	71	52	19	27	August -	—	—	—	—
February -	61	55	6	10	September -	—	—	—	—
March -	59	40	19	32	October -	5	2	3	60
April -	50	26	24	48	November -	25	12	13	52
May -	19	8	11	58	December -	33	23	10	30
June -	3	1	2	66	Total -	328	220	108	33
July -	2	1	1	50					

It is doubtful whether all the cyclones recorded in the tables as stationary were really so, some being included of which only one day's observation was received; but with every allowance for error from this cause, it may still be inferred that as the cyclone season approaches its height, the proportion of rapidly progressing cyclone areas increases, and that at the commencement and end of the season they may be more or less stationary.

The coast of Madagascar, as before stated, is occasionally visited by cyclones; one of great violence passed over the centre of the island on February 20th, 1876, uprooting and breaking down many thousands of trees; its centre passed close to Tamatave. On February 25th, 1885, another storm centre passed 30 miles northward of St. Mary island and crossed Madagascar; it was severely felt at Tamatave, where a French transport and a mail steamer were wrecked with a loss of 30 lives. Tamatave again suffered greatly on February 22nd, 1888, when many houses were unroofed, and the French corvette *Dayot*, with nine other vessels, were wrecked, and 23 lives were lost in the vessels. This storm was of comparatively short duration, and the extreme fall of the barometer less than one inch. The last cyclone recorded at Tamatave occurred in December, 1904.

Cyclones were formerly considered as rare visitants in the northern part of the island; probably that opinion was based on lack of knowledge, as since the French occupation of the island several have been recorded; the first one passed over Diego Suarez bay, in February,

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1894, when the new church at Antsirana, with its tower, were completely destroyed; also two are recorded as having passed over the northern end of the island during 1899, both of which crossed the Mozambique channel and passed southward a short distance off Mozambique. Previous to these, one of the best recorded is that which crossed that channel on January 28th—30th, 1887, in a westerly direction from northward of Cape St. Andrew, its centre passing over the Castle Line ss. *Courland*, in lat. 20° S., long. 37° E., about 50 miles southward of the Zambesi. This vessel experienced strong S.S.E. winds when proceeding up the coast from Delagoa bay, with violent squalls, a constantly increasing sea and falling barometer; eventually she was compelled to head the terrific sea, when the centre passed over her. The only noticeable feature in an almost uniformly overcast sky—over which the drift scudded furiously—was a peculiar leaden hue in the zenith; there was no heavy solid banking up of clouds, and very little thunder and lightning, but the rain was heavy and continuous. The barometer, however, proved a true friend, and fell from 29.61 at noon on the 29th, to 28.98 at 8 p.m. on the 30th, at which time the centre passed over the ship, and the stars became visible overhead.

The wind in this cyclone blowing from the northward on the coast of Madagascar, caused an extraordinary high tide and heavy sea at Morondava, threatening the destruction of the houses, which hitherto had been considered far above the reach of the sea.

The latest cyclone recorded similar to that described, and one of the most violent and extensive, occurred in December, 1904. It first struck the northern part of Madagascar in its approach from the Indian Ocean, doing much damage between the 14th and 16th December at Diego Suarez and along the north-western coast of Madagascar at least as far as Majunga. The northern limit of its track was clearly defined by the island of Grand Comoro escaping, whilst the other islands of the Comoro group all suffered from the visitation. In its course down the Mozambique channel, it apparently occupied the whole width of the narrowest part. The ss. *Putiala*, coming up from Delagoa bay, bound to Zanzibar, first encountered it between 7h. and 9h. p.m. on the 16th December in about lat. 15° S. She was hove-to for several hours, then steered northward and finally emerged from the cyclone on the morning of the 18th in about lat. 12° 30' S. H.M.S. *Terpsichore* had anchored in Fernando Verozo bay on the afternoon of the 16th; the weather being very threatening she put to sea about 6h. a.m. on the 17th, and on that day about noon the *Terpsichore* and *Putiala* must have been within 30 or 40 miles of each other, the latter to the eastward and in close proximity to the centre of the storm; both vessels reported the wind to be of hurricane

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strength and a terrific sea running; both sustained considerable damage, but, being large and well-found, weathered the storm without serious injury beyond loss of boats, &c. The lowest reading of the barometer on board the *Terpsichore* was 29·47, and on board the *Putiala* 28·70. As the weather moderated after midnight the *Terpsichore* shaped a S.S.W. course, and at 5h. a.m. on the 18th was able to steer direct for Mozambique, in which port she anchored at 2h. p.m. on the same day. For track of this cyclone, see Appendix.

General Characteristics of Cyclones in the South Indian Ocean.—With the exception of the possibly stationary cyclones previously referred to, these storms have, as usual, an onward movement in addition to the rotary motion round the centre of depression. In the heart of the cyclone, the wind blows in a more or less circular direction round the centre; at the same time the storm field advances, sometimes with great velocity, and sometimes appearing to pause or scarcely to advance more than a few miles in an hour. The rate of the onward movement has been found to vary from 60 to 320 miles a day.

The space over which cyclones have been known to expand varies from 20 or 30 miles to some hundreds of miles in diameter; the wind blows with an ever varying force, now lulling into little more than a strong breeze, and as the centre is approached often rising into a blast of irresistible fury.

As already explained, it is an invariable characteristic of these storms, that in the northern hemisphere they rotate in the opposite direction to the hands of a watch placed face upwards, and with the hands of a watch in the southern hemisphere. The knowledge of this law gives the seaman an approximate idea of the bearing of the centre or vortex, and therefore indicates the way to avoid the position of greatest danger, where the fury of the wind is most extreme, the changes of its direction most sudden, and the sea most to be dreaded.

It was remarked by Dr. Meldrum that, when in the season and region of these storms, the seaman should not hastily conclude that every strong gale accompanied by a falling barometer is of a rotary character, for such a gale may not be part of the cyclone which is travelling in the neighbourhood.

On approaching a cyclone on its southern side, a vessel always encounters a strong trade wind, and it is difficult to know when the trade wind merges with the storm field; the bearing of the centre of depression can then seldom be inferred from the direction of the wind. To assume therefore that every S.E. gale accompanied by a falling barometer is part of a cyclone of which the centre bore N.E. might lead to error. In this state of uncertainty, the safest plan is to lie-to and carefully watch the wind and barometer. If the wind should

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haul decidedly either to the East or South, the passage of the centre with respect to the vessel's position may be approximately inferred; and when the barometer has *fallen about six-tenths from its position at the commencement of the gale*, the position of the centre may be taken as nearly at right angles to the wind.

If with the vessel hove-to, the wind remains in the same direction, S.E., and increases in strength, with a falling barometer, it may be concluded that the vessel lies in the path of the advancing storm, and the only resource is to run to the N.W. if possible.

It was also remarked by Dr. Meldrum, that north-easterly and easterly winds often, if not always, blow towards the centre. Assuming this to be the case, a vessel having the wind between North and East should make as much easting as possible. The same writer remarks, that all homeward-bound vessels putting into Mauritius for repairs, do so in consequence of having sustained damage in a cyclone which they entered from the North. There is a strong temptation to such vessels to run with a favourable breeze; but an increasing northerly or north-easterly wind, with a falling barometer and bad appearance of the weather, should warn them to heave-to in time.

The indications of the approach of a cyclone are the usual ugly and threatening appearance of the weather which forebodes most storms, and the increasing number and severity of the gusts with the rising of the wind. These signs are in some cases preceded by a long heavy swell and confused sea, which comes from the direction in which the storm is approaching, and travels more rapidly than the storm itself.

The best and surest of all warnings, however, is given by the barometer. In every case there is great barometric disturbance, the barometer at the centres of some depressions standing fully two inches lower than outside the storm field. Accordingly, if the barometer falls rapidly; or even if the regularity of its diurnal variations be interrupted, danger may be apprehended.

No positive rule can be given as to the amount of depression to be expected. There are numerous records of the barometer falling below 28 inches in the West Indies, and the suddenness of the fall may be realised by an authenticated record of a fall of 1·7 inches in one hour and ten minutes. Dr. Meldrum says that in the Southern Indian Ocean the barometer commonly falls below 28 inches, and in the Bay of Bengal a pressure of 27·58 inches is said to have been observed. The average barometric gradient near the vortex of the most violent of these storms is said to be rather more than one inch in 50 miles.

Practical Rules for avoiding Cyclones.—When in the region, and in the season of revolving storms, be on the watch for the premonitory signs. *Constantly observe and record the barometer.*

When running with a freshening but steady breeze and the pre-

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monitory indications of a cyclone being near are observed, heave-to, and then note the changes of barometer and wind, so as to find the bearing of the centre, and ascertain by the shifting of the wind in which semicircle the vessel is situated. Much will often depend upon heaving-to in time.

When, after careful observation, there is reason to believe that the centre of a cyclone is approaching, the following rules should be followed in determining whether to remain hove-to or not, and the tack on which to remain hove-to:—

In the Southern hemisphere.—To find the centre of the cyclone.—Face the wind, and if the barometer has only fallen from 2 to 3 tenths, take 10 or 12 points to the left of the wind for the centre; if the barometer has fallen 5 tenths or more, the centre will be about 8 points to the left of the wind. With the wind from between North and East, the centre may be as much as 16 points from the wind; or in other words, the wind may be blowing directly towards the centre. This has only been observed in Indian Ocean cyclones.

To find on which side of the path the vessel lies:—If the wind shifts in the direction of the movement of the hands of a watch, as from S. to S.W., West, the vessel is in the right-hand semicircle looking in the direction the storm is travelling; if the wind shifts against the hands of a watch, as from South to S.E., East, the vessel is in the left-hand semicircle.

If in the right-hand semicircle, run, keeping the wind, if possible, on the port quarter; and when the barometer rises, if necessary to keep the vessel from going too far from the proper course, heave-to on the starboard tack. If in the left-hand semicircle, heave-to on the port tack. In each case, the vessel will be on the tack on which she will “come up” as the wind shifts and the storm field passes on.

When the vessel lies in the direct line of advance of the storm—which position is, as previously observed, the most dangerous of all—run. And in all cases act so as to increase as soon as possible the distance from the centre; bearing in mind that the whole storm field is in all probability advancing.

On the eastern side of a cyclone, with the wind between North and East, vessels should make as much easting as possible.

In receding from the centre of a cyclone, the barometer will rise and the wind and sea subside.

It should be remarked that in some cases, if the storm field be travelling slowly, but this is quite uncertain, vessels may sail from the dangerous semicircle across the front of the storm, and thus out of its influence. This is, however, a most hazardous proceeding, and the seaman should hesitate before he attempts to cross under any circumstances.

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BAROMETER.—In the Southern Indian Ocean the average range of the barometer in the higher latitudes, that is, between 50° and 60° S., is about 1·5 inches, but on extraordinary occasions ranges of 2·75 and 3·0 inches have been recorded.

Within the tropics generally, the range during ordinarily settled weather varies from 0·15 to 0·4 inches; the former being in the neighbourhood of the equator. There are also four regular diurnal variations in barometric pressure, the highest readings being at 10 a.m. and 10 p.m., the lowest at 4 a.m. and 4 p.m.; the difference being about one-tenth of an inch. The average movement of the barometer within the tropics being confined within such small limits, any great divergence from this regular movement may be deemed a warning of approaching bad weather. Within this area the fall of the mercury during a hurricane, as explained under the heading *Cyclones*, ranges from one to 2 and even to 2½ inches; the rapidity of the fall increases as the centre of the storm approaches, and it may be as low as 27·70 in the centre.

In the southern hemisphere the effect of the shifting of the wind on the barometer is according to the following law:—

It rises with southerly and falls with northerly winds, thus:—With East, N.E., and North winds the barometer falls; with N.W. winds it ceases to fall, and begins to rise; with West, S.W., and South winds it rises; with S.E. winds it ceases to rise and begins to fall.

THERMOMETER.—Sea temperature.—The mean sea surface temperature in the more southern latitudes changes but little throughout the year; near Kerguelen, for instance, it is about 40° in all months; farther North it varies considerably, according to the season. From January to March, the temperature of the sea surface off the western coast of Australia is about 5° lower than on the eastern coast, and the difference ranges from 5° to 10° in October, November, and December, but there is little or no difference from April to September.

Throughout the year, the temperature of the sea off Cape Colony is about 10° lower off the western than off the eastern coast. In January, February, and March, areas of great change are found along the South coast of Cape Colony; and in May, there is a similar area off Sydney, New South Wales.

The region of greatest range of sea temperature, 20° and upwards, lies westward of the 70th meridian of East longitude, and between lats. 39° and 45° S.

The temperature of the Equatorial current is at the eastern part about 72°, and in the vicinity of Rodriguez 81°.

Air temperature.—Over the ocean, the general distribution of air temperature is very similar to that of the sea, being fairly uniform

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throughout the year in the neighbourhood of Kerguelen, while in more northern latitudes there is a difference of about 10° between summer and winter mean temperatures. Over these more northern latitudes, however, the temperature of the air is generally a few degrees lower than that of the sea.

Of land temperatures, wherever statistics are available, they are given in the body of this work in connection with the descriptions of the various localities, and also in tables of Appendix.

Chart 1241, Ice chart of the Southern hemisphere.

ICE.—Definitions of ice terms.—Ice is only met with in the southern regions of the ocean under consideration in this work, but as it is desirable that seamen should be acquainted with and use the terms generally accepted in describing navigation where ice prevails, the following definitions are given:—

- FIELD ICE** - - A large body of unnavigable flat ice, the extent or boundaries of which may or may not be seen from the masthead.
- FLOE ICE** - - Several pieces of field ice pressed or frozen together.
- LAND ICE** - - Field or floe ice which has not been detached from the shore since the winter.
- HUMMOCKY ICE** - - Elevations in field or floe ice caused by two or more bodies of ice being pressed together.
- PACK ICE** - - A large collection of pieces of ice, from broken-up floe or icebergs, which have, more or less, closed together again.
 The pack is said to be "open" when it presents leads, or lanes, of water between the pieces of ice, forming more or less promising navigable channels; and "close" when it is not possible to navigate through the collected pieces of ice.
- DRIFT ICE** - - Unattached pieces of floating ice easily navigable.
- BRASH OR SLUDGE ICE** A collection of very small pieces of broken-up ice through which a vessel can easily force her way.
- PANCAKE ICE** - - Ice newly frozen, of insufficient thickness to prevent navigation, sometimes separated into cakes suggestive of the name.
- BAY ICE** - - Ice newly frozen, of sufficient thickness to prevent navigation.

Chart 1241, Ice chart of the Southern hemisphere.

- ICEBERG** - - - Floating ice, formed on shore, usually of compressed snow, and detached from its parent glacier. In the Arctic the icebergs are comparatively small: in the Antarctic they have been known to be 20 miles in extent.
- FLOEBERG** - - - A thick piece of salt water ice presenting the appearance of a small iceberg.
- ICE BLINK** - - - A peculiar white reflection in the atmosphere seen immediately over distant ice in large quantities, the ice itself not being visible.
- A LEAD OR LANE** - A navigable channel in a "pack" or other collection of ice.
- OPEN WATER** - - - Free navigable water adjacent to an ice-encumbered channel or sea.
- ICE FOOT** - - - The ice frozen to the shore which does not rise and fall with the tide.

Icebergs, &c.—The following remarks are mainly abridged from those of Lieut. C. W. Baillie, R.N.:—Between the Cape of Good Hope and Tasmania, ice is seldom met with North of lat. 40° S. During the last 70 years only ten bergs have been reported northward of this, and they were in the immediate vicinity of the Cape. Between lats. 40° and 45° S. they are mostly seen between long. 40° and 60° E. Between lats. 45° and 50° S., ice may be met with anywhere westward of long. 90° E. Eastward of that meridian it is much rarer.

The amount of ice seen and reported in different years varies much. Thus, in 1891, no ice was seen between the Cape and Tasmania, and in 1892 a few scattered bergs only, but in 1893 a larger number were seen northward of lat. 45° S. between the meridians of Greenwich and Cape Agulhas. In 1894, these bergs appeared between lats. 43° and 52° S. and long. 10° and 70° E. In 1895, they were seen between the same meridians and between lats. 42° and 47° S., but few vessels going southward of that parallel. In 1896 and 1897 the conditions were much the same, but in 1898 comparatively few were reported.

During January, 1897, the steamship *Hubback* when passing North of Prince Edward island in lat. $45^{\circ} 18'$ S., met with an iceberg a mile in length and 400 feet high, amongst others; subsequently meeting with many more, one of which was 3 miles long and 600 feet high. On passing southward of the Crozet islands an iceberg was observed aground near Penguin island. The *Hubback* continued her way northward of Kerguelen, continually meeting with ice, and in lat. $47^{\circ} 0'$ S., long. $73^{\circ} 25'$ E., passed an iceberg about 5 miles in length, which was the last ice observed.

Chart 1241, Ice chart of the Southern hemisphere.

The temperature of the air was 40° to 45° , of the sea water 39° to 44° , being the maximum and minimum for the whole period.

From the foregoing remarks it will be observed that the liability to encounter ice is much increased the farther a vessel goes southward of lat. 40° S.; and, though the length of the days in summer in high latitudes decreases the danger of accident by night, yet the prevalence of fog, snow, and thick weather makes it quite possible for a vessel to run foul of an iceberg in the day time, and mariners are cautioned accordingly.

It has been computed that the life of an iceberg when it has drifted up into a temperate climate can scarcely be considered as less than 10 years, and its destruction is then probably more due to wave action than to increased warmth of air and water.

It should also be borne in mind that when in or near regions where ice may be met with, it should not be assumed that equability of temperature of air or water, or both, indicates the absence of all danger; for numerous instances are on record of icebergs having been passed close to without the slightest fall in temperature of either air or water.

Monthly current charts, Indian Ocean.

CURRENTS.—South Indian Ocean.—A general outline of the most important currents of this ocean may be summarised by first considering that there are two principal streams, which both receive and throw off others of minor importance.

The **connecting or counter current** flows primarily from the South Atlantic, and while receiving a contribution from the Antarctic it flows eastward in a broad belt a considerable distance southward of the Cape of Good Hope. After passing the cape, it is joined by a branch of the Agulhas current, which thus returns to the Indian Ocean a portion of the water flowing out of it south-westward past the south-eastern coast of Africa. The rate of the counter current is uncertain, it being so much influenced by the wind; near the meridian of Cape Agulhas it is about 30 miles a day. The width, after being joined by the Agulhas stream, is from 200 to 240 miles; that is, between 36° or 37° S. and 40° or 42° S.; becoming much wider at the eastern part. See also Africa Pilot, Part III.

Equatorial currents.—Before reaching the south-western end of Australia, the counter current divides, one part continuing eastward between the coast of Australia and the 40th parallel; the other turning northward along the western coast of Australia, tends to form the Equatorial current about the Tropic of Capricorn, which gathers strength and diminishes in breadth as it flows westward. Near the eastern part, it is found as far South as the 25th parallel; about the meridian of Rodriguez, it is not so far South, while the northern limit

Monthly current charts, Indian Ocean.

is about the parallel 10° S. The velocity of the Equatorial current varies greatly, but averages between 20 and 25 miles a day.

Throughout the large space between the counter current and the Equatorial current there is no certainty which way a vessel may be set, though those varying currents are sometimes very strong.

In the vicinity of Mauritius the Equatorial current divides, forming two great streams, one towards the northern end of Madagascar and the other towards the southern end, while the central part impinges on the coast of that island at a point between Tamatave and St. Mary island, where it again divides, one branch being deflected northward and the other southward; the strength of each branch current being greatest at a few miles off-shore.

The southern branch of this current presses against the long straight line of the Madagascar coast as it flows south-westward, increasing in strength until reaching the south-eastern extreme of the island, which it passes in its progress to join the Agulhas current sometimes at the rate of 50 or 60 miles a day at and beyond 10 or 15 miles from the land, but close in-shore it is weak. This south-westerly current extends nearly 500 miles southward of Madagascar from October to April, but less during the other season, the mean velocity being about $1\frac{1}{2}$ miles an hour. An off-shoot from it flows round the southern end of the island into the Mozambique channel, as described at page 23.

The northern branch, which strikes the coast South of St. Mary island, turns up the coast north-eastward and northward, constantly augmented by other portions of the main current from the South-east; it acquires great velocity as it passes onwards towards Cape Amber, the northern point of the island. For currents on the eastern side of Madagascar, *see* also pages 232, 233.

Off Cape Amber, the current flows towards the Comoro islands and the coast of Africa throughout the year with considerable velocity, averaging 2 miles and sometimes attaining a rate of 3 miles an hour. In general it runs westward so rapidly that steam vessels alone attempt to round that cape from the westward; the same current, but with diminished strength, extends 50 miles northward of the cape, beyond which, at times, a counter current is found flowing north-eastward, with a mean velocity of one knot. Between Cape Amber and the Farquhar islands a northerly set of 22 miles in 16 hours has been experienced.

Northward of the Mozambique channel, the Equatorial and drift currents combined, having passed Cape Amber, flow towards the coast of Africa and divide near Cape Delgado; but, during the N.E. monsoon, especially in December, January, and February, the division takes place as far North as lat. 10° or 9° S.; during the remainder of the year, it is southward of lat. 11° S.

During the S.W. monsoon, one part of the current so divided runs

Monthly current charts, Indian Ocean.

northward along the coast of Africa, passing Zanzibar and Pemba, and from thence towards Cape Guardafui; but, during the N.E. monsoon (November to March) it is deflected eastward from the land before reaching the Equator, which it skirts on the southern side, or passes a little to the northward, thus forming a zone of easterly counter current, of which the southern limit is about in lat. 6° or 8° S. In the centre of this area, during January and February, this variable but east-going current attains at times a rate of $2\frac{1}{2}$ knots and even more. Both winds and currents in this zone are subject to great variation and uncertainty.

The Mozambique channel being screened by Madagascar from the free action of the currents in the Indian Ocean, but affected by the varying force of the streams flowing round either end, as well as by many local disturbances, its currents are somewhat uncertain. That portion of the Equatorial current which, in the vicinity of Cape Delgado, turns southward and flows through the Mozambique channel along the African coast without intermission throughout the year, though varying in volume and velocity, and generally at its strength at from 60 to 80 miles off-shore, has, during the Northern monsoon, a rate varying from 36 to 72 miles a day; and sometimes, in the height of that monsoon, to nearly 100 miles a day. It passes Cape Corrientes almost constantly to the southward at from one to 2 knots an hour.

During the Southern monsoon, the strength of this stream is reduced to from one to 2 knots, and sometimes, if the monsoon is very strong, it ceases to run. Eastward of this main stream a counter or variable current is generally experienced, and in the southern part of the Mozambique channel the temperature of the water may indicate the presence of this counter current; if below 68° it may be concluded that the vessel is certainly eastward of the south-going stream.

Off Mozambique, the current has been known to set S.E. by E. 4 miles an hour; and 60 miles to the southward, from N.N.W. to W.N.W. at from one to $2\frac{1}{2}$ miles; whilst at times and under certain circumstances, as already stated, it has been known to cease altogether.

In the large bight of Sofala on the African coast, commencing almost as far south as Cape Corrientes and extending northward beyond Kili-mán river, there is often a counter current setting north-eastward and extending a considerable distance off-shore, especially off Sofala and during the strength of the Southern monsoon. In May, a rate of 35 miles a day has been recorded.

Between the Comoro islands and the outer edge of the south-going coast current, and from thence southward until past the narrow part of the Mozambique channel, no dependence can be placed on the direction or force of the current—it may run 3 miles an hour one way, and at times as much another.

Monthly current charts, Indian Ocean.

In the vicinity of the Comoro islands, the current generally runs westward, but a little southward of them there is frequently a counter current setting eastward. Northward of the Comoro islands a north-westerly current of one or $1\frac{1}{2}$ miles an hour is generally found.

Between May and August, the strength of the Southern monsoon, and as far westward as 40° E., a current apparently sets north-westward from the South extreme of Madagascar up past Europa island and then turning more northward, but it should not be depended on.

In the middle of the Mozambique channel, southward of lat. 18° S., there is more often a northerly than a southerly current, the wind being generally from the southward. Near Europa island, in November, it has been found setting north-westward from 2 to $2\frac{1}{2}$ miles an hour, causing strong tide rips, but neither the rate nor direction of these currents may be the same for two consecutive days.

Along the southern coast of Madagascar, the current sets principally from East to West, and with less strength than off the south-eastern point, *see* page 21, but it occasionally turns eastward, rendering care necessary when approaching the southern coast. The usual westerly current turns to the northward along the south-western coast of Madagascar at about 18 miles a day, but gradually becomes feeble, and along the western coast generally the current as a rule flows to the northward very slowly; even this, however, is not to be relied on, as at times it has been found on this coast setting southward no less than 36 miles in one day. *See also* Africa Pilot, Part III.

Caution.—The great strength, variety of direction, and general uncertainty of the currents in all parts of the Mozambique channel render it necessary for a vessel's position to be constantly verified by observation. Along the western coast of Madagascar, the current, usually of no great strength, appears to follow the direction of the wind; sometimes, however, as just stated, it changes to a directly opposite direction and with considerable strength, preceding a change of wind.

The general southerly current from the Mozambique channel after passing Cape Corrientes, eventually unites with the branch of the great current which passes southward of Madagascar in about lat. 28° or 30° S., and the union of the two streams forms the commencement of the Agulhas current, for the description of which *see* Africa Pilot, Part III.

Charts 748a, b.

DOCKS, &c.—There are no Naval dockyards or establishments on any of the British possessions within the limits of this work. The French government have a Naval establishment at Diego Suarez in Madagascar, where there is a basin, and a dry dock building.

At Mauritius, there are two dry docks belonging to the Dry Dock and Slips Company; also a patent slip. Vessels not exceeding

17 feet draught may be safely docked here. For full particulars, *see* Appendix. The nearest dock accommodation, at present, for large vessels in need of such, in this part of the world, is, however, to be found either at Bombay or at Colombo; *see* Dock book.

COAL may be obtained at the British possessions of Seychelles and Mauritius (in large quantities at the latter). Also there is a fair supply at Diego Suarez, and small quantities at St. Mary, Tamatave, and Nosi Bé, but it mostly belongs to the French government. A considerable quantity is kept in stock at Port de Galets, Réunion, but it is only supplied as an act of courtesy. Not very distant from these coaling stations are Zanzibar and Mozambique, with several others between that and the Cape, *see* Africa Pilot, Part III. The mode of shipping coal is given in the descriptions of the various places, though it may here be mentioned that at only one of them, Port de Galets, is there a wharf alongside of which a large vessel can coal lying afloat.

COMMUNICATIONS.—Regular steam communication is maintained with Madagascar and the principal islands, as follows:—

1. **Messageries Maritimes.**—The steam vessels of this line start from Marseilles twice a month, and call at Port Said, Suez, and Jibuti. The ones leaving on the 10th then call at Mombassa, Zanzibar, Mayotta, Majunga, Nosi Bé, Diego Suarez, Tamatave, Réunion, and Mauritius; those leaving on the 25th, after calling at Jibuti, call at Aden, Seychelles, Diego Suarez, St. Mary, Tamatave, Réunion, and Mauritius. There are branch connecting steamers between Majunga and Durban which go down the western coast of Madagascar, touching at Maintirano, Morondava, Ambohibé, and Tulléar; and branch steamers between Diego Suarez and Tamatave once every two months, calling at intermediate ports; branch steamers between Tamatave and Fort Dauphin once a month, calling at intermediate ports, and from Fort Dauphin, continuing to Durban, once every two months, and to Tulléar once every two months; also branch steamers with a monthly service between Diego Suarez and Zanzibar, calling at Nosi Bé, Analalava, Majunga, and the Comoro islands both ways.

2. **Havre Peninsula Company.**—These vessels start from Havre and Bordeaux, touch at Marseilles, and from thence to Majunga, Nosi Bé, Diego Suarez, Tamatave, Andovoranto, Vatomandri, Mananzari, Réunion, and Mauritius.

3. **Chargeurs Réunis Company.**—The vessels of this line also start from Havre and Bordeaux, touch at several places on the West coast of Africa, and call at the Cape and Lorenzo Marques *en route* to Majunga, Tamatave, Vatomandri, Mananzari, and Fort Dauphin.

The above French lines all carry cargo at through rates from London.

4. **Castle Line.**—From London *via* the Cape, calling at Fort Dauphin, Mananzari, and Tamatave, *en route* to Mauritius.

5. **British India Line** run a four-weekly service from Bombay *viâ* Seychelles to Zanzibar and Delagoa bay, calling at other African ports *en route*. These steamers also ply between Seychelles and Mauritius.

6. **Deutsche-Ost-Afrika**.—From Hamburg to Natal, calling at Mayotta, Nosi Bé, and Majunga, if assured of sufficient freight. From Natal to India, calling at Seychelles.

Portuguese.—A small steamer of the Company Empresa Nacional de Navigacao sometimes runs between Lorenzo Marques, Durban, the West Coast ports of Madagascar, and Diego Suarez.

Chart 1188, Coal and telegraphs.

SUBMARINE CABLE AND TELEGRAPH LINES.

—Mojanga is connected by cable with Mozambique, and therefore is in telegraphic communication with all parts of the world; Tamatave is connected by cable with Réunion and Mauritius; Antananarivo is in telegraphic communication with all the most important places in Madagascar.

From Zanzibar and Durban there is cable communication with Seychelles and Mauritius, and through the latter with Rodriguez, Cocos or Keeling island, and Fremantle in Western Australia.

Mojanga is in communication with Mayotta and Johanna (Comoro islands) by wireless telegraphy.

TIME.—The time kept at Mauritius and Seychelles, including their dependencies (Chagos archipelago excluded), also at Réunion, is that of the 60th meridian East, or 4 hours fast of Greenwich mean time. Chagos archipelago keeps that of the 75th meridian East, or 5 hours fast of Greenwich mean time. Madagascar keeps that of the 45th meridian East, or 3 hours fast of Greenwich mean time. Mozambique keeps local time. Time signals are made at Port Louis, Mauritius.

PASSAGES.

Charts 1077 and 1078.

Full-power steam vessels always make their passages by the most direct possible safe route, with, occasionally, some slight divergence to secure a favourable current or to avoid a heavy sea, &c.

Sailing vessels adopt those routes where they are most likely to be favoured by leading winds and by currents, distance being a secondary consideration, and often greatly increased.

Low-powered steamers take nearly the same route as sailing vessels. Such vessels can in some cases take the full-power steam route, but must always be guided by the extent of their steaming capacity.

FROM THE CAPE THROUGH MOZAMBIQUE CHANNEL.—Full-power steamers at all seasons run direct at a safe distance along shore as far as Algoa bay, thus avoiding the strength of the Agulhas current, and being sometimes assisted by a

Charts 1077 and 1078.

counter current extending from one to 6 miles off-shore, especially between Cape Agulhas and Kowie river; but guard against indraught and avoid all salient points.

From Algoa bay, if not calling at intermediate ports, a vessel should edge off to about 80 or 100 miles from the coast, where the current is weak, and from thence steer direct for the middle of the Mozambique channel, edging in again for Port Mozambique when nearing it, if bound for that port, but bearing in mind that the current runs from 2 to 4 knots to the southward when within about 60 miles of that coast, and is at its strongest during the N.E. monsoon.

On account of the uncertain set of the currents in the Mozambique channel, frequent observations for ascertaining a vessel's position are imperatively necessary.

Sailing vessels.—From October to April, when the prevailing winds on the southern coast of Africa are easterly, and at any season if south-easterly winds are blowing, a vessel should first make southing until in lat. 39° or 40° S., or even farther southward in the month of January, when with favourable winds and current easting may be made until about on the 30th meridian; then, edging gradually to the northward the 40th meridian may be crossed between 32° and 33° S., the course inclined still more to the northward, and the 30th parallel crossed in 42° E., from thence about true North, an allowance being made for south-westerly current, and so continuing past the western side of Madagascar, at a convenient distance outside the reefs.

In this track, vessels will avoid the strongest part of the south-westerly current, and will be nearly sure of a fair wind until about half-way through the Mozambique channel, when adverse winds may be expected; should such occur, it is better to make easting on the port tack rather than westing; thus avoiding the African coast with its prevailing southerly current.

The passage on the eastern side of Europa island is recommended, but vessels should not approach that island nor the Basses da India reef at night, the currents in their vicinity, as described at page 22, being very strong and uncertain. If bound to Mozambique, edge in when abreast and make the land northward of it, as both wind and current at this season tend to set the ship to the southward. Vessels bound to the north-western coast of Madagascar should pass close westward of the island of Juan de Nova. When near the Madagascar coast, advantage may be taken of the alternating land and sea breezes.

If bound for Bombay or for African ports northward of the Mozambique channel, it is often preferable to avoid that channel altogether and to pass eastward of Madagascar. With this intention, after leaving the Cape, easting should be made in about lat. 39° or 40° S. until in about long. 45° E., when the vessel should edge away north-eastward, crossing lat. 30° S. in about

Charts 1077 and 1078.

long. 53° E., afterwards standing to the northward, passing westward of Réunion and round the northern end of Madagascar, from whence both wind and current are favourable for Zanzibar.

From April to October, inclusive, when westerly winds prevail off the Cape of Good Hope, vessels may make the first part of the passage near the coast, where they will sometimes be favoured by a counter current, but must guard against indraught. They should not, however, go northward of about lat. 35° S. until in long. 37° E., when they should steer to cross lat. 30° S. in about long. 42° E., afterwards running northward through the channel as before described, and at this season probably carrying a fair wind right through.

On leaving the Cape, if south-easterly winds prevail, vessels should at once stand to the southward and make their easting in lat. 39° or 40° S. (as in October to April). In all cases, vessels making for these parallels should steer nothing eastward of South in order to avoid the area south-eastward of the tail of the Agulhas bank, where gales and heavy cross seas prevail.

Low-powered steamers.—October to April.—The same as the sailing route. If bound northward of the Mozambique, the route eastward of Madagascar should be taken, in which case, probably, steam would not be required.

From April to October.—As in the sailing route through the Mozambique channel.

RETURN ROUTE.—Full-power steamers.—Direct along-shore at all seasons.

Sailing vessels.—N.E. Monsoon, October to April.—Keep well off the land until up to Cape Delgado, as the wind sometimes hangs to the eastward and even southward of East; from thence, stand down the coast, inside the Lazarus bank, keeping in the strength of the Mozambique and Agulhas currents and making Cape Agulhas. A vessel will probably have to work to windward in the southern part of the Mozambique channel, the prevailing winds there being southerly.

S.W. Monsoon, April to October.—Stand out to the eastward on the starboard tack until able to weather Cape Delgado on the port tack, then make the best of the way down the coast, keeping in the strength of the current. From Algoa bay, with a westerly wind, a vessel should keep on the Agulhas bank in smooth water.

Low-powered steamers take the sailing route.

CAPE OF GOOD HOPE TO BOMBAY.—(*Possibly touching at Seychelles or Mauritius.*)—Though this route goes rather beyond the scope of this work, it is given because vessels taking it and requiring to replenish their coal supply, cannot depend upon

Charts 1077 and 1078.

doing so to any great and certain extent except either at Seychelles or Mauritius.

Full-power steamers proceed from the Cape through the Mozambique channel as just described, passing westward of Mayotta island and of the Cosmoledo group, and thence direct to Bombay. If calling at Seychelles for coal, after passing Juan de Nova island, a vessel should steer as direct as possible for Seychelles and from thence to Bombay, the distance in this case being increased by about 25 miles only.

If passing eastward of Europa island in the Mozambique, the distance in each case is about 40 miles greater, but the currents are more favourable.

An alternative route is to round the South end of Madagascar, about 200 miles distant, and from thence steer direct for Bombay, but calling, if necessary, at Mauritius or Seychelles for coal. By this route the distance is about 200 miles greater, but, if calling at either of the islands named, it is about 70 miles farther still.

Sailing vessels.—April to October.—Four distinct routes may be taken during this season, viz., by the Mozambique channel, East of Madagascar, the Boscawen passage, and the Middle passage.

The Mozambique channel route, described at page 26, should only be taken when certain of reaching India before the close of the S.W. monsoon. By it, a vessel, after passing Juan de Nova island, should pass through the Comoro islands, cross the Equator in long. 53° or 54° E. and then steer direct for Bombay.

In the height of the S.W. monsoon, June, July, and August, great care is required in making Bombay.

The passage eastward of Madagascar should be taken only when certain of reaching port before the end of the S.W. monsoon; it is often preferred to the Mozambique channel, as less dangerous and the winds more steady, especially in August and September, when light and variable airs prevail in that channel. Proceed by it as described at page 26, pass westward of Réunion and of the Amirante islands, cross the Equator in long. 53° or 54° E., and then steer direct for Bombay.

The Boscawen passage is to be preferred when there is doubt as to reaching port before the beginning of the N.E. monsoon. Proceed as before from the Cape, but make easting to about long. 50° E., then edge away north-eastward and cross the parallel of 30° S. in about long. 59° E., then run northward through the trades, passing between Réunion and Mauritius, and westward of the Saya da Malla

Charts 1077 and 1078.

bank. Cross the Equator in about 62° E., and then steer direct for Bombay.

The Middle passage is sometimes adopted by vessels towards the end of the S.W. monsoon, but it is not recommended, calms and light winds being more probable by it than by the Boscawen. The difference between the two consists only in crossing the Equator from 6° to 8° farther East by the Middle than by the Boscawen passage.

In case the N.E. monsoon has commenced, vessels should close with the land after passing the Maldivé islands.

November to March.—From the Cape, stand to the southward and make easting in lat. 39° or 40° S., or even farther South in January, until in long. 65° E., then stand to the northward and enter the S.E. trade wind in from 26° to 28° S. and long. 80° to 83° E. Run through the trade and N.W. monsoon, cross the Equator in from 80° to 85° E., the farther East the safer, and make northing into the N.E. monsoon, when stand for Cape Comorin and work up the Malabar coast, taking advantage of the land and sea breezes.

Low-powered steamers.—April to October.—Follow either of the sailing routes described and under the same conditions.

November to March.—As in the sailing route, but crossing the Equator in from 80° to 81° E.

RETURN ROUTE.—Full-power steamers.—Direct for the Mozambique channel and by it to the Cape, as described at page 27. During the height of the S.W. monsoon, steer to cross lat. 5° N. in about long. 65° E., thus avoiding the strongest part of the monsoon; from thence pass westward of the Seychelles, and from thence down the Mozambique channel as before.

Sailing vessels.—February to October.—Stand down the coast of India and across the Equator into the S.E. trades, then steer to pass southward of Mauritius, and about 100 miles southward of Madagascar, and make the African coast about 200 miles south-westward of Port Natal. From thence, keep in the strength of the Agulhas current until abreast of Mossel bay, and then direct round Cape Agulhas.

In the early part of the monsoon, June and July, when the wind is more southerly than later on, vessels should get an offing from Bombay into about 50 fathoms water before standing down the coast, and should then keep in about 40 or 50 fathoms to ensure being well in-shore of the Laccadive islands.

November to January.—Direct through the Mozambique channel and along the African coast, keeping in the strength of the Mozambique and Agulhas currents. In rounding the Cape, if westerly

Charts 1077 and 1078.

winds prevail, keep on the Agulhas bank not more than 40 or 50 miles from the coast; here the sea will be smoother than elsewhere.

Low-powered steamers.—March to October.—The same as the sailing route from February to October.

November to February.—As in the sailing route through the Mozambique channel.

CAPE OF GOOD HOPE TO CALCUTTA and BAY OF BENGAL, &c.—Full-power steamers.—In this passage also it is frequently necessary to call at either Seychelles or Mauritius, according to the route taken, for coal. There are two routes. One through the Mozambique channel and calling at Seychelles, as just now described, and from thence through the One-and-a-half-degree channel and round the South end of Ceylon. The other, passing 200 miles southward of Madagascar, coaling at Mauritius, and from thence direct round the southern end of Ceylon.

By the first route, at all seasons, there will be less adverse winds, and less sea to encounter than by the second, and, in consequence, less wear and tear to a vessel.

Return Route.—Direct past the south-eastern end of Ceylon and eastward of the Chagos group, calling at Mauritius, if necessary, for coal and making the African coast, as before described, about 200 miles south-westward of Natal; from thence, keeping in the strength of the Agulhas current until abreast of Mossel bay, and then direct as possible round Cape Agulhas.

From Rangoon, during June, July, and August, it is best to pass eastward of the Andaman and Nicobar islands, and from thence, viâ Mauritius to the Cape, increasing the distance by about 180 miles.

ZANZIBAR TO MAURITIUS. — Full-power steamers.—Direct route at all seasons.

Sailing vessels.—April to October.—Stand to the eastward, regardless of crossing the Equator in so doing, until eastward of the Chagos group, when southing should be made into the trade wind, and then a direct course steered for Mauritius.

November to April.—Make easting with the N.E. and N.W. monsoons and cross lat. 10° S. in about long. 70° E., and from thence direct through the trade for Mauritius. Vessels should keep northward of a line drawn from Zanzibar to the Seychelles until in the N.W. monsoon.

An alternative route at this latter season is to stand down through the Mozambique channel, taking advantage of the current on the African coast. Then, from the southern end of the channel, stand south-eastward into the westerly winds and make easting southward of

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the 35th parallel. Recross lat. 30° S. in about long. 58° or 59° E., and then make direct for Mauritius through the trade.

This being the cyclone season, the first route is the safest, as the path of these cyclones is then more easily avoided.

In leaving Zanzibar in either season, it is best to run through the lee pass, for the time being. If bound southward during the S.W. monsoon, this appears to put a vessel a long way to leeward, but, as a rule, nothing is lost by it; for in order to work to the southward, an offing of 90 miles must be gained to be clear of the north-going in-shore current, and this can be accomplished in a shorter time by running out with a fair wind.

Low-powered steamers.—As in the sailing routes.

Return route.—Direct for all vessels.

ZANZIBAR TO SEYCHELLES. — Full-power steamers.—Direct route at all seasons.

Sailing vessels.—April to October.—Stand eastward on the starboard tack, and if unable to fetch the islands continue on past them until able to fetch them on the other tack. About June and July vessels can generally fetch them without tacking.

October to April.—Keep northward of the direct route while working eastward until the N.W. monsoon is picked up, which may be expected, but is very uncertain, after passing long. 45° E. Light winds and calms render this generally a tedious passage.

Low-powered steamers.—As in sailing routes.

RETURN ROUTE.—Full-power steamers.—Direct.

Sailing vessels.—April to October.—Direct, but allowance to be made for the probability of the wind heading and for the strong northerly current to be entered on nearing the African coast. It is best to sight the northern end of Mafia island and then to pass in-shore of Latham island.

October to April.—Stand to the south-westward and round the southern end of the Amirante islands; from thence, direct.

Low-powered steamers.—April to October.—As with the sailing route at this season.

October to April.—Direct.

MOZAMBIQUE TO SEYCHELLES. — Full-power steamers bound for Mahé, in the Seychelles, take the direct route.

Sailing vessels.—April to October.—Direct, keeping as far to windward as possible.

November to March.—Stand over to the coast of Madagascar and work north-eastward along that coast until near Cape Amber, then

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stand northward across the current rounding that point from the eastward, and pass eastward or westward of the Amirante group as the wind may permit; always a tedious and uncertain passage.

Low-powered steamers.—April to October.—Direct.

November to March.—Stand across to the Madagascar coast, then north-eastward along that coast until near Cape Amber, then northward, passing eastward of the Amirante group.

RETURN ROUTE.—Full-power steamers.—Direct.

Sailing vessels.—April to October.—Stand out on the starboard tack until able to weather the southern end of Mahé; then, on the port tack, pass to windward of Alphonse island and just to leeward of Providence island; from thence, as direct as possible. Towards the end of the season, a vessel may even weather the Farquhar islands.

November to March.—As direct as possible.

Low-powered steamers.—April to October.—The same as the sailing route.

November to March.—Direct.

MOZAMBIQUE TO MAURITIUS. — Full-power steamers.—Direct as possible round the northern end of Madagascar.

Sailing vessels.—April to October.—Work to the southward, keeping in the strength of the current on the African side of the channel, as far as Cape Corrientes or even beyond that cape; from thence, stand south-eastward, and make easting on about the parallel of 30° S. until on the meridian of Mauritius; from thence direct in the S.E. trade. If bound to Port Louis and approaching from the southward pass eastward of the island and round the northern end, in order to avoid the calms and baffling winds under the high land near the south-western part of the island.

November to March.—Stand down the African coast, keeping in the strength of the current. Then, from the southern end of the Mozambique channel, stand south-eastward into the westerly winds and make easting southward of lat. 35° S. Recross the parallel of 30° S. in about long. 58° or 59° E., and make direct for Mauritius through the trade wind.

An alternative route in case a south-westerly wind should be blowing in the Mozambique channel at the time of leaving port, a thing not unknown during the season of the N.E. monsoon, is, to stand over to the Madagascar coast, working north-eastward along it to near Cape Amber, then to stand northward, and to make easting southward of the Amirante and Seychelles groups until beyond the Saya de Malha bank; from thence, direct for Mauritius. This is, however, generally

Charts 1077 and 1078.

a slower route than the other, and there is more danger of meeting with cyclonic disturbances.

The distance is about the same by both routes.

Low-powered steamers.—The same as for sailing vessels.

RETURN ROUTE.—**Full-power and low-powered steamers.**—Direct as possible round the northern end of Madagascar.

Sailing vessels.—April to October.—Round the southern end of Madagascar, and run up the Mozambique channel on about the 42nd meridian. When nearing Port Mozambique edge in for it, making allowance for the strong south-going current when within 60 or 70 miles of the land.

November to April.—Direct as possible round the northern end of Madagascar. Guard against the strong south-going current when approaching Port Mozambique and make the land northward of that port.

N.B.—Vessels bound to the north-western coast of Madagascar should always go round the northern end of that island; and those bound to the western coast, or to any ports on the African coast southward of Kilimán, round the southern end.

SEYCHELLES TO COLOMBO.—Full-power steamers take the direct route through the One-and-a-half degree channel.

Sailing vessels.—April to October.—Direct through the Eight-degree channel; or, pass through the more direct route offered by the Cardiva channel; but not at night, unless the entrance has been made before dark, or the latitude of the vessel is accurately and with certainty known.

November to March.—Run to the eastward in about lat. 5° S., cross the Equator in from 82° to 84° E., and stand to the northward into the N.E. monsoon, when make for and round the south-western end of Ceylon and work up the coast, taking advantage of the land and sea breezes.

Low-powered steamers.—April to October.—The same as the sailing route.

November to March.—Similar to the sailing route, except that the Equator should be crossed in about 80° or 81° E.

RETURN ROUTE.—**Full-power steamers** proceed direct through the One-and-a-half degree channel from April to October; distance, 1,650 miles; but from November to March they take the route through the Eight-degree channel, which route avoids a good deal of adverse current.

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Sailing vessels.—April to October.—Get a good offing, then stand to the southward across the Equator into the S.E. trade. Pass southward of the Chagos group and then direct.

November to March.—Pass through the Eight-degree channel, run westward through the N.E. monsoon, and cross the Equator in about long. 54° E.

Low-powered steamers.—The same as the sailing route.

SEYCHELLES TO ADEN.—Full-power steamers make the passage direct round Cape Guardafui throughout the year, but during the S.W. monsoon Ras Hafún should be made before Cape Guardafui.

Sailing vessels.—April to October.—Direct for Ras Hafún and round Cape Guardafui, then work along the African coast until up to Burnt island, and then stand across the gulf for Aden.

November to March.—Cross the Equator in about long. 68° E., work to the northward, and when in the N.E. monsoon stand direct for the Gulf of Aden, passing northward of Sokotra if possible.

Low-powered steamers.—April to October.—As in the sailing route.

November to March.—Cross the Equator in about long. 61° E., and steam to the northward into the N.E. monsoon; then stand for the Gulf of Aden as in the sailing route.

RETURN ROUTE.—Full-power steamers.—Direct round Cape Guardafui at all seasons.

Sailing vessels.—April to September.—Round Sokotra and stand to the south-eastward across the Equator. After losing the S.W. monsoon, work to the southward into the S.E. trade, and thence direct for the Seychelles.

October to March.—Work along the Arabian coast until able to weather Cape Guardafui. From thence direct.

Low-powered steamers.—April to September.—The same as the sailing route.

October to March.—Either steam along the Arabian coast until able to weather Cape Guardafui, or else steer for Cape Guardafui direct, and having rounded it, direct.

SEYCHELLES TO MAURITIUS. — Full-power steamers.—Direct.

Sailing vessels.—April to October.—Stand to the eastward until eastward of the Chagos group, then make southing into the S.E. trade, and then steer direct for Mauritius.

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November to March.—Run to the eastward, cross lat. 10° S. in about long. 70° E., make southing into the S.E. trade, and then steer direct for Mauritius.

Low-powered steamers.—April to October.—Stand eastward to about long. 70° E., then steam to the southward until well into the S.E. trade and then direct for Mauritius.

November to March.—Run eastward past the Saya de Melha bank, then steam southward into the S.E. trade, and then direct for Mauritius as before.

RETURN ROUTE.—Full-power steamers.—Direct.

Sailing vessels and low-powered steamers.—April to October.—Direct.

November to March.—Keep rather westward of the direct route until in the N.W. monsoon, and then as direct as possible.

EAST COAST OF MADAGASCAR TO MAURITIUS.—Full-power steamers.—Direct.

Sailing vessels and low-powered steamers.—Vessels should take advantage of every variation in the breeze to make easting, giving a preference to northing withal, until sufficiently advanced to fetch their destination on the port tack.

Return route.—Direct for all vessels.

NATAL TO MAURITIUS.—Full-power steamers should take the direct route round the southern end of Madagascar, giving that island a berth of about 100 miles, to avoid the strength of the westerly current.

Sailing vessels and low-powered steamers.—Stand to the south-eastward, and make easting in about lat. 35° S. From about long. 50° E. keep gradually more to the northward, crossing the parallel of 30° S. in about long. 58° or 59° E., and then direct through the trade wind to Mauritius.

Return route.—Direct for all vessels, passing about 100 miles southward of Madagascar, and making the African coast well northward of Port Natal.

CAPE OF GOOD HOPE TO MAURITIUS.—Full-power steamers.—Direct alongshore out of the Agulhas current as far as Algoa bay, but carefully guarding against indraught and avoiding all salient points. From Algoa bay, as direct as possible, but keeping about 200 miles from the southern end of Madagascar.

Sailing vessels and low-powered steamers.—Make southing and cross the meridian of 20° E. in from 39° to 40° S. latitude; from thence make easting as far as long. 50° E. and then edge away

36 PASSAGES.—CAPE OF GOOD HOPE & ADEN TO MAURITIUS. Chap. I.

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north-eastward, crossing lat. 30° S. in about long. 59° E., and from thence steer direct for Mauritius in the S.E. trade wind. As previously stated, vessels from this direction bound for Port Louis should pass eastward and round the northern end of Mauritius in order to avoid the calms caused by the high land near the S.W. extreme of the island.

RETURN ROUTE.—Full-power steamers should pass about 100 miles southward of Madagascar and make the African coast about 200 miles south-westward of Natal, afterwards keeping in the strength of the Agulhas current until abreast of Mossel bay; from thence, steer direct to round Cape Agulhas at a prudent distance.

Sailing vessels and low-powered steamers.—The same as with full-power steamers, except that when nearing the Cape, with strong westerly winds, they should keep on the Agulhas bank, not more than 40 or 50 miles from the coast, where they will have smoother water than elsewhere.

ADEN TO MAURITIUS.—Full-power steamers make the direct route from Cape Guardafui, calling if necessary at Seychelles *en route* for coal.

Sailing vessels.—April to September.—Pass northward of Sokotra, run through the S.W. monsoon, cross the Equator in about 72° E. or even run through the One-and-a-half-degree channel, and make southing into the S.E. trade, passing eastward of the Chagos group. From thence, direct to Mauritius.

October to March.—Work along the Arabian coast until able to weather Cape Guardafui, run through the N.E. and N.W. monsoons, crossing the Equator in about long. 64° E., and the parallel of 10° S. in about long. 70° E., and when in the S.E. trade steer direct for Mauritius.

Low-powered steamers.—April to September.—As in the sailing passage.

October to March.—Steam along the Arabian coast until able to weather Cape Guardafui, or steer direct for it, and from thence proceed as in the sailing route.

RETURN ROUTE.—Full-power steamers take the most direct route at all seasons.

Sailing vessels.—April to September.—Pass westward of the Amirante islands, and from thence direct for Cape Guardafui. Then work along the African coast as far as Burnt island before standing across for Aden.

October to March.—Run northward through the S.E. trade and the N.W. monsoon, cross the Equator in about long. 68° E., make

Charts 1077 and 1078.

northing into the N.E. monsoon, and then steer direct for the Gulf of Aden, passing northward of Sokotra if possible.

Low-powered steamers.—April to September.—The same as the sailing route.

October to March.—As in the sailing passage but crossing the Equator in long. 61° E.

CAPE OF GOOD HOPE TO PRINCE EDWARD, MARION, AND CROZET ISLANDS.—Make southing from the Cape, and, should the wind be favourable, cross the meridian of 20° E. between lats. 39° and 40° S., at all times of the year, but should it hang to the southward or south-eastward keep on the port tack, crossing the parallel of 39° S. as far westward as the 15th meridian rather than run the risk of being set on the tail of the Agulhas bank and encountering the heavy sea there. When in the latitude named, steer direct for the island desired, bearing in mind, when making either of them from to windward, that they are on that side frequently hidden by mist, when they may be seen at a considerable distance from to leeward.

CAPE OF GOOD HOPE TO KERGUELEN.—Make southing as before, and when in lat. 40° S. run to long. 45° E.; then shape course for Bligh's Cap, an islet near the North extreme of Kerguelen island.

Return route.—From Kerguelen, stand to the northward, going free on the port tack with the prevailing westerly wind into the S.E. trade to about lat. 25° S.; then steer westward passing about 100 miles southward of Madagascar, and thence to the Cape as though from Mauritius or from the Straits of Sunda. If from the Crozets or other of these southern islands farther westward, stand to the northward as from Kerguelen; then make the African coast as before.

CAPE OF GOOD HOPE TO AUSTRALIA.—The following route in the South Indian Ocean has been adopted by the steamships of the Shaw Savill and Albion Company, the New Zealand Shipping Company, and the White Star line.

The respective meridians are to be crossed as follows:—Long. 40° E. in lat. $43^{\circ} 10'$ S.; long. 50° E. in lat. $44^{\circ} 50'$ S.; long. 60° E. in lat. $45^{\circ} 25'$ S.; long. 70° E. in lat. $45^{\circ} 40'$ S.; long. 80° E. in lat. $45^{\circ} 55'$ S.; long. 90° E. in lat. $46^{\circ} 30'$ S.; long. 100° E. in lat. $47^{\circ} 00'$ S.; long. 110° E. in lat. $46^{\circ} 45'$ S.; long. 120° E. in lat. $46^{\circ} 20'$ S.

CAPE OF GOOD HOPE TO STRAITS OF SUNDA.
—**Full-power steamers** proceed alongshore as far as Algoa bay, as previously described, and then follow the great circle route to the

Charts 1077 and 1078.

Straits of Sunda; this route passes just southward of the Keeling or Cocos islands.

Sailing vessels.—April to September.—On leaving the Cape, sailing vessels should stand to the southward, and then make their easting in lat. 39° or 40° S., keeping between these parallels. From thence, edge away to the north-eastward, crossing lat. 30° S. in long. 100° E. or thereabouts, and lat. 20° S. in about long. 150° E., passing close westward of Christmas island and up to Java head; but care must be taken to keep well to the eastward, especially in June, July, and August, when the S.E. monsoon is at its strongest, or the vessel may fall to leeward of Java head and find great difficulty in regaining it against wind and current.

From October to April, after passing St. Paul island, cross lat. 30° S. in about long. 95° E., and from thence steer direct for Sunda Strait, taking care at this season to pass well westward of Java head, as westerly winds then blow at times with great strength along the southern coast of Java. Should contrary winds be met with after passing St. Paul island, stand at once to the northward through the S.E. trade into the N.W. monsoon, and then direct to the Straits of Sunda.

Low-powered steamers take the same route as sailing vessels.

RETURN ROUTE.—Full-power steamers.—From Sunda strait follow the rhumb line across the Indian Ocean to make the African coast about 200 miles south-westward of Natal, and thence proceed as if from Mauritius, *see* page 35.

Sailing vessels and low-powered steamers.—May to October.—From the Straits of Sunda, when fairly in the Indian Ocean, shape course to pass about 100 miles southward of Madagascar and from thence as in the passage from Mauritius.

November to April.—This being the season of the N.W. monsoon; from the Straits of Sunda, stand to the southward into the S.E. trade and then proceed towards the Cape as before, bearing in mind that this is the cyclone season in the Indian Ocean.

MAURITIUS TO AUSTRALIA. — Full-power steamers bound to Fremantle, King George sound, or Port Adelaide, follow the great circle track. If bound into or through Bass strait, follow the great circle route to Moonlight head, and from thence through Bass strait and coastwise to the port of destination. If bound to Hobart, follow the great circle track to the southern end of Tasmania as far as the vertex (lat. $45^{\circ} 33'$ S., long. $125^{\circ} 40'$ E.), and from thence the rhumb line.

Charts 1077 and 1078.

Sailing vessels and low-powered steamers.—From Mauritius make southing, as so frequently described, and having made it, proceed as though from the Cape of Good Hope, running down the easting in about lat. 40° S. If bound for King George sound, proceed direct when in about long. 105° E. If for Port Adelaide, proceed direct for Cape Borba, Kangaroo island, when on the meridian of Cape Leeuwin. If for Port Phillip or for Sydney through Bass strait, proceed direct for Moonlight head when in about long. 135° E.

Many vessels follow a more southerly route than is here given, going in fact as far southward as the parallel of 52° S., but a higher latitude than 40° S. is not recommended, as southward of this the weather becomes more boisterous and stormy; and sudden changes of wind with wet squally weather must constantly be expected, especially after passing eastward of St. Paul island. Icebergs and field ice are also often encountered in these more southern regions, sometimes with fatal results. The greatest number of icebergs may be expected to be sighted in the summer months of November, December, and January, and the least number in July.

RETURN ROUTE.—Full-power steamers take the direct route.

Sailing vessels and low-powered steamers.—From Melbourne and the south-eastern coast of Australia, there are two routes according to the season, thus:—

Northern route.—April to October.—At this season, the S.E. monsoon connects the S.E. trade of the Pacific with the S.E. trade of the Indian Ocean; the passage is therefore made either by the Inner or Outer route to Torres strait, low-powered steamers always taking the Inner route, and from thence through the Arafura Sea into the Indian Ocean and direct to Mauritius.

Southern route.—December to April.—Easterly winds being now prevalent on the southern coast of Australia, vessels take the southern route; those from Sydney should keep in the strength of the south-going current, about 15 to 18 miles off-shore, along the south-eastern coast of Australia; thence through Bass strait and direct for Cape Leeuwin, not going southward of lat. 40° S. When round Cape Leeuwin stand to the N.W. into the S.E. trades, and then direct for Mauritius.

CHAPTER II.

SEYCHELLES AND AMIRANTE GROUPS.—ALPHONSE, COETIVY, AND
AGALEGA ISLANDS. — SAYA DE MALHA BANK. — CHAGOS
ARCHIPELAGO.

(Lat. $3^{\circ} 20' S.$ to lat. $12^{\circ} 0' S.$)
(Long. $52^{\circ} 40' E.$ to long. $72^{\circ} 40' E.$)

VARIATION IN 1911.—Decreasing about $4'$ to $2'$ annually.

Chart 721, Seychelles group with outlying islands. Var. $2^{\circ} 30' W.$

SEYCHELLES. — GENERAL REMARKS.* — This extensive coral reef, on which are some 29 islands and islets besides many rocks, extends about 200 miles in an E.S.E. and W.N.W. direction, between the parallels $3^{\circ} 40' S.$ and $6^{\circ} 5' S.$, and between the meridians $53^{\circ} 57' E.$ and $57^{\circ} 10' E.$

They comprise two coral islands and 17 granite islands. The two coral islands lie on the northern edge of the bank, where alone there is a trace of a barrier commencing to grow up. The granite islands all rest on the centre of the bank, and such shoals as occur near them are not, as far as could be ascertained, of coral origin. Immediately around the granite islands are here and there fringing reefs, especially in bays; but these, if of any great size, have in every place granite islets or masses to give them, as it were, support, and to show their foundations. Nullipores practically do not enter into their composition, and such coral masses as grow are of comparatively small size.

The granite formation of the islands forms the only exception to the otherwise universal rule that oceanic islands are of recent volcanic formation.

The principal group was first discovered in 1506 by the Portuguese commander, Dom Pedro Mascarenhas, who gave them the name of *Sete Hermanos* (Seven Brothers); but there was no important settlement made on them until after 1742, in which year Mahé de la Bourdonnais, the then French governor of Mauritius and Bourbon, sent an expedition to take possession in the name of France, and gave the

* J. Stanley Gardiner, M.A., 1905. *Geographical Journal*, Vol. XXVIII., 1908.

Chart 721, Seychelles group, &c. Var. 2° 30' W.

name of Bourdonnais to the group collectively, while the largest island was called Mahé; the principal islands were colonised by the French in 1743, but the name of the group was subsequently changed to Seychelles, after the French minister Viscount Hérault de Seychelles, the largest island still retaining the name of Mahé. The islands were captured by the British in 1794, and finally assigned to Great Britain by treaty in 1814. The group was for many years administered as a dependency of Mauritius, but with the other islands described in this chapter now forms a separate colony.

The islands were partly examined by Captain Fairfax Moresby, assisted by Lieutenant George J. Hay, of H.M.S. *Menai*, in 1821-2; by Captain W. F. W. Owen, R.N., in 1825; by Commander W. J. L. Wharton and officers of H.M.S. *Fawn*, in 1877; by Captain Maclear and officers of H.M.S. *Alert*, in 1882; and by others at various periods; but the extremes of the great bank and the shoal patches near the outer edge, common to all coral reefs, have not yet in most parts been closely examined nor their extent accurately ascertained.

SEYCHELLES ISLANDS.—The principal islands are Mahé, Praslin, Silhouette, and La Digue, besides which are many others of less extent and importance. They are mostly high, well watered, and covered with trees, among which the *coco de mer*, growing only on Praslin and Curieuse islands, is the most remarkable.

Government.—Port Victoria, in Mahé, is the principal town and seat of government for the whole colony. The islands of this group were formerly governed by an Administrator subordinate to the Governor of Mauritius, but by the issue of letters patent dated 21st July, 1897, they became independent of Mauritius, and on 7th November, 1903, were proclaimed a colony, the Administrator being appointed Governor. The colony includes the Amirantes Archipelago, consisting of 27 islands, or atolls, divided into five groups, known as African Banks, St. Joseph Group, Poivre Island, Alphonse Group, and Providence Group; the Cosmoledo islands, 12 in number; and the Aldabra Group of five islands.

The whole colony consists of 90 islands and groups of islands, several of which are situated over 600 miles from Mahé.

The estimated population on December 31st, 1910, was 22,620, viz., 11,522 males and 11,098 females.

There are 24 schools for primary education, 20 being Roman Catholic, and all are supported by Government grants in aid. The system of secondary education tried in 1900 failed, and a new system was brought into force in 1910.

General charts 2899, 748b.

Chart 721, Seychelles group, &c. Var. 2° 30' W.

Climate.—The climate of the Seychelles, generally, from their position is equable, and is the healthiest of any British possession within the tropics; the heat is seldom oppressive in the shade during the forenoon, and the thermometer frequently falls below 70° during the night.

The death-rate in 1910 was 16·3 per thousand, and the birth-rate 31·3 per thousand; the average death-rate for the previous 10 years was 16·8 per thousand.

Currency.—The medium of exchange is the Indian rupee; the paper money of Mauritius is accepted by the Treasury, but not paper money of the Government of India. The gold coinage of the United Kingdom and Bank of England notes are accepted at par at the Treasury and at the Post Office. The metric system of weights and measures is in force.

Time.—The standard time of the 60th meridian of East longitude, or 4 hours fast of Greenwich mean time, is adopted in the Seychelles.

Communications. — Mahé is in telegraphic communication by cable with Zanzibar and Mauritius, and consequently with the main systems of the world; but there is no inland service. The telegraph office is open all night. The mail service is performed by the Messageries Maritimes Company. Mails for Seychelles are made up in London on the 23rd and 8th of each month. The passage of the former mail, which comes direct, occupies 17 days; the latter mail is sent *viâ* Diego Suarez, and arrives at Mahé on the 8th of the following month. Mails from and to India and Africa are carried by the British India and German East African steamers. A Government steam launch of 30 tons runs between the islands of the Seychelles Archipelago for administrative purposes and passenger traffic. The Amirantes Archipelago, Cosmoledo islands, and the Aldabra Group are served by sailing craft owned in Seychelles.

Products.—The principal products of the colony are cocoanuts (from which copra, cocoanut oil, soap, &c., is manufactured), vanilla, guano, tortoise-shell, turtle, mangrove bark, salt fish, cloves, and essential oil.

The cocoanut industry is the principal one in the colony; the cultivation of the trees has been very much improved, so the production has increased considerably; the total value of the cocoanut production in 1895 realised Rs. 4,09,000; in 1907 it realised Rs. 7,77,000.

The vanilla industry, which formerly was the principal one, has been found to be so capricious (such a trifling variation in sunshine and rainfall having an enormous effect on the crop) that it cannot now be calculated upon as a staple product, so all proprietors plant and tend their vines, but only as a by-product, which may bring much or little pocket money.

General charts 2899, 748b.

Chart 721, Seychelles group, &c. Var. 2° 30' W.

The guano industry is increasing considerably; the value realised in 1906 was Rs. 1,64,000, and in 1909 it realised Rs. 5,24,500, with half a million tons of guano in reserve.

The fisheries of the colony admit of enormous development, given enterprise and capital, as the numerous lagoons and shoals teem with fish, which, salted, would find a ready market in Mauritius and Réunion. The turtle fishing, both edible and hawks bill, might be largely increased, and there is a good opening for the cultivation of mother-of-pearl shell and sponges.

Rubber, which was first planted 1904-1906, shows great promise, and it is estimated that 25 tons of rubber may be placed on the market in 1911.

Wind and weather.—The South-east monsoon generally blows from May until the middle of October, but, some years, is not thoroughly established until June or July; this is the fine season, when the climate is delightful; in November there are heavy squalls of wind and rain. The North-west monsoon, the wet season, is from the middle of November or beginning of December until the beginning or end of April; during these months the wind blows from N.W. or W.S.W. In December and January the weather is close and disagreeable, though the North-west monsoon is accompanied by violent squalls and almost continuous rain. The average annual maximum shade temperature for the last 14 years, taken at the Port Office, Victoria, at a station 15 feet above mean sea level, ranged from 81° to 85°; the annual average minimum from 75° to 77°. The average rainfall per annum during 23 years was 103·3 inches; the greatest, in 1903, being 133 inches, and the least, in 1909, 79·9 inches. *See Meteorological table in Appendix.*

Cyclones are of rare occurrence; they are more frequent at 200 miles south-eastward of Mahé.

SEYCHELLES BANK.—The depths over the vast bank on which the Seychelles islands stand are irregular, varying from 11 to 45 fathoms, with occasional spots of much shoaler water, especially at the eastern and western parts. The northern edge is marked by Bird and Dennis islands, and an examination by H.M.S. *Stork* in 1892 shows that a nearly continuous rim of more or less shallow water extends from Bird island to the western extreme of the bank, and from thence for a long distance round its southern side. As many dangerously shoal spots may exist on this rim besides those already known, vessels should avoid crossing it northward of the 5th parallel of South latitude. Southward of this parallel, according to the scanty information at present existing, there would appear to be a break in the rim.

General charts 2899, 7486.

Chart 721, Seychelles group, &c. Var. 2° 30' W.

The positions of the various shoaler portions of the main body of the bank are best ascertained by reference to the chart, and only some of the more dangerous are mentioned in this work. The following shoal patches lie principally near the outer edge, and no-doubt others will be discovered. Vessels navigating in this vicinity should exercise great caution and vigilance, which, in conjunction with a timely and careful use of the lead, may be expected in course of time to yield much useful information.

Outer shoals.—Beginning at Dennis island and working round by the eastern, southern, and western sides of the bank, the following shoals will be found:—

At about 12 miles E. $\frac{1}{4}$ S. from Dennis island lighthouse there is a 9-fathoms patch, and 4 miles nearer the lighthouse on the same line is a patch with from 7 to 10 fathoms; both patches are but little within the edge of soundings.

In 1869, H.M.S. *Forte* found 10 fathoms in lat. $4^{\circ} 30'$ S., long. $56^{\circ} 23'$ E., about 38 miles E. by S. $\frac{1}{2}$ S. from Praslin, 4 miles north-eastward of the Topaze bank, and only 3 miles within the edge of soundings.

Topaze bank.—This extensive coral bank, about 21 miles long W. by N. and E. by S. by 12 miles wide within the 10-fathoms line, has depths of from 7 to 11 fathoms, and was examined by H.M.S. *Topaze* in 1820. The eastern part lies close within the 100-fathoms line, and is 28 miles eastward of Frigate island, while the western edge is about 7 miles eastward of that island, with a depth of at least 36 fathoms between it and the island.

Zoroaster shoal (Lat. $5^{\circ} 0'$ S., Long. $56^{\circ} 40'$ E.), a coral bank of 7 fathoms least water, was passed over by a brig of that name. It was thought from appearances that there was less water on some spots.

At 5 or 6 miles northward of the Zoroaster shoal, also at 5 and 11 miles south-eastward, and at 17 or 18 miles in a S.S.W. direction, there are patches of 9 fathoms. Other 9-fathoms patches have been reported, and it is very evident that the bottom in this vicinity is very uneven.

Junon bank.—In 1864, the French frigate *Junon* found from $11\frac{1}{2}$ to 17 fathoms on the meridian $57^{\circ} 5'$ E., and between the parallels $5^{\circ} 5'$ S. and $5^{\circ} 11'$ S. Another vessel having on the same meridian and between the parallels of $5^{\circ} 10'$ S. and $5^{\circ} 20'$ S. found from $11\frac{1}{2}$ to 13 fathoms, this is now considered part of one and the same bank, and is charted as extending from $5^{\circ} 6'$ S. to $5^{\circ} 18'$ S. Its eastern side must be near the edge of soundings, and westward of it there are depths of 28 fathoms.

General charts 2399, 748b.

Chart 721, Seychelles group, &c. Var. 2° 30' W.

Gilberte shoal.—This shoal is reported to have been passed over by a French schooner of that name in 1873; from 6 to 10 fathoms were obtained for about 2 miles in a North and South direction, on what appeared to be a circular bank, the South point of Mahé, which was in sight at the time, bearing N.N.W. distant 22 miles. Until further verification, this shoal is considered as of doubtful position, and is so shown on the chart.

A depth of 9 fathoms was obtained, westward of this position, by H.M.S. *Hermes*, in 1911, in lat. $5^{\circ} 4' S.$, long. $55^{\circ} 3' E.$, and it appears probable that there may be less water.

Seagull shoal (Lat. $4^{\circ} 42' S.$, Long. $54^{\circ} 11' E.$).—In 1882, H.M.S. *Seagull* obtained depths of $5\frac{1}{2}$ fathoms about 14 miles from the western part of the bank, or about 45 miles E. by N. from the African islands. These depths appear to be near the south-eastern corner of a triangular patch some 6 miles in extent on each side, with general depths of from 7 to 9 fathoms; within 2 or 3 miles southward of it soundings have been obtained in 640 and 706 fathoms.

The shoalest part of the Seagull shoal is only about 16 miles from the western extreme of the Seychelles bank, and here again forming the rim at the edge of soundings are depths of 10 and 11 fathoms.

About 10 miles S.E. by E. from the Seagull there are 12 fathoms, close to the edge of the bank, and, farther eastward, depths of from 11 to 16 fathoms, similarly situated, are frequently to be found; in 1905 the *Sherard Osborne* obtained 10 fathoms, E. by S., a distance of about 20 miles from the Seagull. About 14 miles N. $\frac{1}{2}$ E. from the Seagull shoal and towards the north-western edge of the bank is a 7-fathoms patch, with depths of 10 and 11 fathoms 3 miles beyond it in the same direction, close to a depth of 240 fathoms off the bank. At about 7 miles within the bank in this vicinity is the 9-fathoms patch reported by the *Conquest* in 1890.

Dupont shoal (Lat. $4^{\circ} 15' S.$, Long. $54^{\circ} 25' E.$), of $3\frac{1}{2}$ fathoms, lies some 7 miles within the north-western edge of the bank, and about 17 miles S.S.W. $\frac{1}{2}$ W. from the Swan shoal, in which space there is a bank with 7 fathoms. Along the edge of the bank there appears to be in this vicinity, for a space of about 12 or 13 miles, a ridge with only from 7 to 9 fathoms, with ocean depths immediately outside.

Swan shoal.—The position of this danger, over which there are only 3 fathoms, was determined by the whaler *Swan*, which passed twice over it and communicated with Captain Owen in 1825. It is considered to lie 41 miles W. by S. $\frac{3}{4}$ S. from Bird island, and to have an extent of about 5 or 6 miles.

Vigilant and Andromache shoals, found by H.M. ships

General charts 2899, 748b.

Chart 721, Seychelles group, &c. Var. 2° 30' W.

of those names in 1865 and 1835, respectively, are evidently part of the same ridge, lying close to the edge of soundings. The least water found on Vigilant shoal was 6 and 7 fathoms, and its centre lies about W. by S. $\frac{1}{2}$ S., distant 34 miles from Bird island. The least water found on Andromache shoal was 5 fathoms, and this position lies W. by S. $\frac{1}{4}$ S., distant 24 miles from Bird island.

At 8 miles E.N.E. from the depth of 5 fathoms on the Andromache shoal there is a 6-fathoms patch, north-eastward of which for $3\frac{1}{2}$ miles and until within 13 miles of Bird island, there are only 7 fathoms. Here, however, the water deepens to 30 or 40 fathoms for 7 or 8 miles, until the shoal water extending westward from that island is reached.

Currents.—The direction of the currents over the Seychelles bank and amongst the islands varies with the winds, especially between Mahé and Praslin; thus, during the whole of June and until the end of September it runs a little northward or southward of West at from 24 to 30 miles a day. In October, November, and part of December, it is variable. From the middle of December to the middle of April it runs eastward; at the end of April and during May it is again variable.

Northward of the bank of soundings, the currents are very irregular; they appear to perform the round of the bank, generally running eastward on the northern and westward on the southern side. The rate of these streams appears to depend on the force of the southeasterly wind in the southern hemisphere, and often attains a rate of 2 knots northward of the islands. After a period of W.S.W. wind, the current becomes variable in direction and rate. On the southern side of the bank it runs westward more regularly at about one knot. Sometimes, but rarely, it runs North or South.

Plan of Bird island on 724.

Bird island (Lat. $3^{\circ} 43' S.$, Long. $55^{\circ} 12' E.$), the northernmost of the group, is quite flat, of irregular oval form, about 8 feet above high water, and consists of dead coral overlaid with sand. Thick scrub borders the beach all round except at the northern point, where there is a broad sandy spit about 160 yards long. The eastern and southern sides of the island are fringed by coral for about 2 cables from the shore, which dries at low water springs. Shoal water extends $1\frac{1}{4}$ miles towards the North-west; in other directions, for about half a mile. In the centre of Bird island is a conspicuous clump of trees, 58 feet high, and also a few cocoanut palms; close to the beach at the middle of the western side of the island stands a single conspicuous tree, 54 feet in height, near which are a few fishermen's huts.

General charts 2399, 748b.

Plan of Bird island on 724. Var. 2° 30' W.

Anchorage can be obtained off the western coast of Bird island, from which an extensive bank of sand and weed extends 4 miles. It should be approached with the conspicuous single tree in line with the central clump bearing E. by N., and anchorage taken up at from one to 1½ miles off-shore, in from 4½ to 6 fathoms. Landing can be effected on the West beach; also through a cut in the reef on the southern side of the island; and there is a boat passage through the reef at the north-eastern end. Water of indifferent quality may be obtained about 5 feet below the surface of the soil.

Chart 721.

At 3 miles southward of Bird island is a 5-fathoms coral patch, and in the same direction for a space of 2 miles, are other patches of 8 and 9 fathoms.

Plan of Dennis island on 724.

Dennis island, the north-eastern island of the Seychelles group, is on the edge of the bank, 28 miles E. by S. ¼ S. from Bird island. It is about three-quarters of a mile long, North and South, and one-third of a mile wide, narrowing at the southern end. A coral reef, which dries in patches, projects about 2 cables from its southern and eastern sides; and a shoal flat with coral heads extends from the island southward and westward 6 cables, and northward nearly 2 miles. Dennis island is but a few feet above high water; it is flat, cultivated, covered with trees, and is permanently inhabited. There is a monthly service from Mahé by means of Government sailing cutter.

LIGHT (Lat. 3° 48' S., Long. 55° 40' E.).—On the northern end of the island from a grey iron tower, 90 feet high, is exhibited, at an elevation of 85 feet above high water, a *flashing white light every five seconds*, thus:—flash, *half a second*; eclipse, *four and a half seconds*. The light is visible, in clear weather, from a distance of 14 miles.

Anchorage may be taken up in about 7 fathoms, sand and coral, with the lighthouse bearing S.W. by W., distant 7 cables; and landing can be effected, according to the time of year, near the boat-houses, either immediately westward of the lighthouse, or just southward of the western point of the island.

Chart 721.

At 7 miles eastward of Dennis island there is a 7-fathoms patch, and at 11 miles in the same direction is a depth of 9 fathoms.

Chart 1072, Mahé island and approaches.

MAHÉ ISLAND.—This, the largest and most important of the Seychelles islands, is the south-westernmost of the principal group; it

General charts 721, 2899, 748b.

Chart 1072, Mahé island and approaches. Var. 2° 30' W.

is 16 miles long N.N.W. and S.S.E., and 2 miles wide, but of irregular shape, terminating at its southern end in a single narrow point, but at the northern end in two points enclosing between them a bay of some extent. It has an area of about 56 square miles, and is traversed throughout by a range of hills and mountains, attaining in the northern part a height of nearly 3,000 feet; these are intersected by many deep ravines with perpendicular cliffs, and the summits exhibit many remarkable peaks as presently described. The soil of the island is generally of a reddish colour, and consists chiefly of decomposed granite. About 64 miles of roads are said to exist, but though many are good and fit for carriage traffic, and the mileage of such is annually increased, a large portion still consists of mere tracks or footpaths. The island is, in general, thickly wooded, and in clear weather may be seen 40 or 50 miles distant.

Aspect.—Commencing at the southern end of the island, Mount Lockyer, at $2\frac{1}{2}$ miles north-westward of Capucin point, the south-eastern extreme of the island, rises to a height of 1,241 feet above high water; it is bare and steep, and separated from the hills between it and Capucin point (the highest of them being 1,098 feet) by a valley through which a road runs across the island to Anse Takamaka. On the side of that valley, towards the western end, is a hill 620 feet high with a rather conspicuous clump of casuarinas on its summit.

Castle peak, a most remarkable mountain, is about one-third the length of the island from the southern end; it has three summits, the centre being bare rock, broad and flat, 1,701 feet high, with a stone on its southern side in the form of a thumb which shows prominently. The other two summits are 1,649 and 1,674 feet high respectively. From Castle peak, the ridge takes a N. $\frac{1}{2}$ W. direction for $1\frac{1}{2}$ miles to a summit 2,138 feet high, from whence it branches off north-westward to Mount Harrison and north-eastward nearly one mile to Mount Sebert, on the eastern side of the island, a remarkable thumb-shaped peak 1,803 feet high. Farther inland on a detached hill, 1,376 feet high, stands a building known as Baty house. From Mount Sebert, the range circling round through the summit before mentioned to Mount Harrison, forms the Cascade valley. Mount Harrison is 2,257 feet in height; from it, a deep valley extends towards Port Victoria, in which, at an altitude of 1,515 feet, stands a conspicuous house, to which there is a fairly good road. Nearly 200 feet below it are the church and convent of Misère.

Morne Seychellois, the highest mountain in the island, has four peaks, ranging from 2,764 to 2,993 feet in height; they are a short distance southward of the Trois Freres, with which they are connected by a ridge. These latter consist of three peaks near Port Victoria,

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Chart 1072, Mahé island and approaches. Var. 2° 30' W.

running N.W. and S.E., the central and highest being 2,510 feet. North of Trois Freres, and rising from the valley westward of Victoria, is the conspicuous cone-shaped St. Louis hill, 915 feet high. A good road leads past it across the valley to Belle Ombre in North-west bay.

Signal hill (*Lat. 4° 36' S., Long. 55° 27' E.*) stands northward of the valley running westward from Port Victoria, and is 1,341 feet high; the approach of mail steamers and other vessels is indicated by signals on the flagstaff; a signalman is permanently stationed here. For signals, *see* page 58.

Mount Howard (*Morne Pigeon*) is at the northern end of the island; it is a conspicuous cone-shaped hill 1,490 feet high. Mount Simpson (*Morne Bernard*) is the most prominent of several remarkable peaks on the range of hills running westward from *Morne Seychellois* and on the southern side of North-west bay. It is 2,247 feet high, and is distinguished by a remarkable thumb-shaped rock on its summit. *Morne Blanc*, only 1,500 yards south-westward of *Morne Seychellois*, is on the western side of the island, near the northern part of Boileau bay; it is steep, with conspicuous cliffs about the upper part; the rounded summit is 2,206 feet high.

Coast.—A general description of the coast of the island commencing at the southern point, working up the western side; and then, from the southern point again, working up the eastern side, now precedes the description of Port Victoria.

WEST COAST. — Anchorage. — Caution.—The West coast of Mahé is indented by many small bays, off which anchorage may generally be found outside the reefs, but caution is necessary, as the reefs are mostly steep-to, and the water shoals rapidly towards them.

Police bay.—This bay in the southern end of the island is $1\frac{1}{4}$ miles wide between Capucin and Police points; it is small and deep, with some rocks close in-shore near the middle; there is generally a swell in the bay, when landing is impracticable. Police point has a rounded summit, covered with cocoanut trees, and is steep-to; at 5 cables southward of it is the Capucin rock, awash at low water, and the sea generally breaking heavily on it.

Between Police point and Point Lazare, 4 miles north-westward of it, are five small bays, viz., Bazacar, Corail, Intendance, Takamaka, and Poule bleu (*Baie Lazare*), off which anchorage may be taken up, bearing in mind the caution just given. Within this space, the only dangers needing mention are the two Mascene rocks, $1\frac{1}{2}$ cables off the northern point of Anse Corail; the highest is 32 feet above high water;

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and the two Takamaka rocks, $2\frac{1}{2}$ cables off the southern point of Anse Takamaka, one of which is 12 feet high, the other one foot only.

Lazare point (*Lat. $4^{\circ} 46'$ S., Long. $55^{\circ} 28'$ E.*), high and steep-to, is the southern extreme of an indented headland, which projects considerably beyond the general coastline, and divides the southern bays from Boileau bay, the central bay of the western coast. Lazare headland is covered with cocoanut trees, and is rendered very conspicuous by its two conical hills; the outer one is 487 feet and the inner one 689 feet high.

Boileau bay comprises the large space between Lazare headland and Thérèse island, and has within it several small bays and places where good anchorage may be found, especially in Anse la Mouche, and in Anse Boileau, the small bay just northward of it. Anse la Mouche is on the northern side of Lazare headland, and some distance in, so that it is well protected from the swell; it is the best anchorage on the western coast, but the water shoals very rapidly. Chauve-Souris, a rocky islet $1\frac{3}{4}$ cables from the western point of Anse la Mouche, is a good mark; it is 27 feet high, and shows white in contrast with the land when seen from the offing. The passage between the islet and the shore is clear, and has from 3 to 4 fathoms. The swell generally sets in as far as the anchorages, but good landing can generally be found inside the reefs after passing through one of the openings.

Islets and shoals.—Ile Vache, a rocky islet, $3\frac{1}{2}$ cables from the shore in the northern part of Boileau bay, is 177 feet high, steep-to, and shows white from seaward. About 9 cables N.W. by W. $\frac{1}{2}$ W. from it are the Trois Dames, a group of rocks on which the sea generally breaks. Thérèse island, just beyond in the same direction, is conical, 541 feet high, and covered with trees. At $1\frac{1}{2}$ miles beyond this again, in the same line, is Conception island, 8 cables long, 3 cables wide, 432 feet high near the centre, and covered with cocoanut trees. Landing is at all times difficult on this island except in native boats; the best place is on the northern side of the south-eastern point, where the residents will render assistance with ropes.

Anchorage.—There is a narrow but deep passage between all these islets and the shore, and anchorage may be found in Port Glaud, a small bay eastward of Thérèse island, and also in Port Launay, the next bay to the westward, and lying north-eastward of Conception island; this latter anchorage is available for small vessels, but is contracted by a $3\frac{1}{2}$ -fathoms patch near its centre. More or less swell is generally setting in.

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Ternay point and bluff.—The western side of Port Launay is bounded by the eastern end of Ternay peninsula, which forms a bold headland, and is connected with the main island by a low narrow isthmus; the bluff is 686 feet high and covered with cocoanut trees. The point is high, with deep water close alongside; a large wooden cross stands near the extreme. On the northern side of the peninsula is Port Ternay, well sheltered but deep, and the reef at its head, which does not always break or show in any way, is steep-to.

Between Ternay bluff and Conception island is Ternay pass, a deep and safe channel, but the currents through it are strong. During the South-east monsoon the stream is invariably from the southward.

Outlying shoals. — Pilot patches (*Lat. 4° 42' S., Long. 55° 20' E.*).—This group of three coral patches with from 10 to 13 fathoms over them lies from 3 to 4 miles south-westward of Conception island, and has depths of from 20 to 30 fathoms close around; when over them, in fine weather, the bottom can be distinctly seen.

Stork patch is of coral with a least depth of 3 fathoms; it lies off the centre of Boileau bay, with Lazare point bearing S.E. $\frac{3}{4}$ E., and the South extreme of Thérèse island N. $\frac{1}{2}$ W. distant $2\frac{3}{4}$ miles. The sea was not seen to break on this patch, but the swell increased near it. One mile north-westward of the patch is another, with 10 fathoms over it.

North-west bay, at the northern end of Mahé, is $4\frac{1}{2}$ miles wide, and recedes nearly 2 miles from a line connecting the entrance points; it is deep and free from danger, except the inner part, where there is a 3-fathoms patch, inside of which is anchorage off Belle Ombre, where stands a church and a government school. Very large sharks are frequently seen in this bay.

Requin bank, of coral, with 10 fathoms over it, lies immediately off North-west bay, being about 4 miles from each point of the bay, and 5 miles from its head; it has from 20 to 25 fathoms close around it, and therefore is not dangerous.

EAST COAST.—**Capucin point**, the south-eastern extreme of Mahé island, is high and steep-to, except where a rock 3 feet above water lies three-quarters of a cable to the southward. From Capucin towards Sel point, $4\frac{1}{4}$ miles distant to the northward, the coastline recedes, forming a curve with Lascars point, a slight projection in the centre at the foot of Mount Lockyer, thus dividing the space into two small bays, each fringed by a reef on which the sea generally breaks.

Anse Forban is the southern of these small bays, close northward of Capucin point; there is a passage to the shore at the head through

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the reef. Royal bay is the northern and is just southward of Sel point; the white church at its head is very conspicuous. Opposite this bay also is a passage through the reef, leading to a place where landing may generally be effected. There is a good road from Royal bay to Port Victoria.

The Government lunatic asylum is at Royal bay.

Anchorage may be obtained off the openings in the reef opposite either of these bays, the latter being preferable; but the reef must be approached cautiously, as the water shoals quickly, and the sand and coral bottom is uneven.

Sel point (*Lat. 4° 44' S., Long. 55° 32' E.*) is low, shelving, and rocky; behind it stands Oliver hill, 763 feet high, a detached summit at the end of the Castle Peak range. The hill shows distinctly in some directions; from the eastward it appears dark against the land in the background. Souris islet stands on the reef at 3½ cables south-westward from Sel point; it is small, rocky, and 45 feet high, with a few trees and a little vegetation on it; it is not conspicuous from seaward. A small rock, 8 feet high, stands between it and the shore.

From Sel point to La Rue point, 3¼ miles farther northward, the coast recedes slightly, and is fringed by a reef from 3 to 5 cables wide, on which the sea generally breaks. About half-way between the points is an entrance through the reef to an open space between the reef and the shore, very useful to boats and canoes.

La Rue point is steep with sloping cliffs, off which, scarcely detached from it, and more fully described at page 55, lies South-east island. Behind the point stands a conspicuous cone-shaped hill 818 feet high.

From La Rue point the coast trends north-westward as far as Port Victoria, nearly 6 miles; throughout that distance a fringing reef extends a considerable distance, in some places nearly a mile, off-shore, having through it numerous passages, useful for boats, especially the opening off Cascade bay, a little northward of La Rue point. Except at very low water, landing may be effected at the mouth of the Cascade stream.

North of Cascade bay, on the clifty face of the hill, is a remarkable light-coloured pillar, the top of which is 410 feet above high water.

Plan 722, Approaches to Port Victoria.

Red hill, a short distance southward of Port Victoria, presents to the view some red cliffs and a winding road. On the brow, at an altitude of 662 feet, is a conspicuous building called Brook's Pavilion, and farther back, at a height of 755 feet, stands Edward's house.

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From Port Victoria, presently described, with the islands and shoals fronting it, the coast trends northward about $2\frac{1}{4}$ miles to North-east point, and is fringed with a reef intersected by boat channels. Anse Etoile, southward of North-east point, has two or three houses near it, and there is a good boat entrance through the reef opposite. Hodoul rock, on the reef off Anse Etoile, is 14 feet high, and though naturally appearing of a light colour, it has also been whitewashed for a landmark.

Chart 1072, Mahé island and approaches.

North point, the northern extreme of the island, is $2\frac{1}{2}$ miles north-westward of North-east point, from which to it the coast is fairly steep-to and free from danger. North islet is close off the western side of North point, $1\frac{1}{4}$ cables from the shore. It shows conspicuously when seen clear of the land. Though very small, it is 51 feet high, and the top of a remarkable tree on its centre is 79 feet above high water. The passage between the rock and the point is clear and may be used by boats.

Plan 722, Approaches to Port Victoria.

PORT VICTORIA, on the north-eastern side of Mahé island, fronting the town, formerly known as Mahé, but now, like the port, called Victoria, is the principal harbour in the island, and also the capital and seat of government. The port is enclosed and sheltered by the islands, presently described, standing on detached coral reefs, and is entered from the eastward through the shore reef by a channel $2\frac{1}{4}$ cables wide, turning south-westward to the Inner harbour. The position is easily recognised by Morne Seychellois, the highest peak on the island, which stands $1\frac{1}{2}$ miles S.W. by S. from the town.

St. Anne island (*Lat. 4° 36' S., Long. 55° 30' E.*), the largest and most northern of the group eastward of Port Victoria, is $1\frac{1}{4}$ miles long, N.E. and S.W., by 8 cables wide; it is cone-shaped, 847 feet high, and covered with cocoanut or other trees. On its northern shoulder stands a conspicuous casuarina tree 307 feet above the sea. The island is fringed by a reef, except at the northern point, which is steep-to; on the western side is a white sand-beach and a few scattered houses; the South point is low and sandy.

Beacon island.—This is a small island, 99 feet high, lying 7 cables S.E. from the nearest part of St. Anne island. It is chiefly covered by large boulders, with scanty vegetation between. It appears white, and is the resort of numerous sea birds. Landing on this island is at all times difficult. A pinnacle rock 4 feet high lies off its western end, where shoal water extends about 150 yards, as it does also on the northern side, but the southern side is steep-to.

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Plan 722, Approaches to Port Victoria. Var. 2° 30' W.

Reef.—Southward of St. Anne island, and divided from it by the channel of that name $3\frac{1}{4}$ cables wide, is a large and nearly circular coral reef $1\frac{1}{2}$ miles in extent in a N.E. and S.W. direction and $1\frac{1}{4}$ miles wide. It is divided near the centre by a narrow and intricate boat channel, with a general W.N.W. and E.S.E. direction; northward of which, on the reef, are Mayenne, Round, and Long islands; and southward of it, Cerf island. Where not occupied by the islands, the reef is covered by sand and dries in patches at low water.

Mayenne, Round, and Long islands.—**Quarantine station.**—Mayenne island is close to the north-eastern end of the reef; it is about 500 yards in extent, 204 feet high, and has a conspicuous boulder on its summit. Round island, $1\frac{3}{4}$ cables north-westward of Long island and south-westward of Mayenne island, is round as its name implies, 78 feet high, and covered with trees; the top of one remarkable tree growing near the summit is 161 feet above high water. Long island is nearly 900 yards long W.N.W. and E.S.E. by 400 yards wide, and is covered with cocoanut trees. A boulder on its summit is 276 feet, and the top of a conspicuous casuarina tree 297 feet above high water. On the western end of this island stands the Quarantine station and a flagstaff. For Quarantine regulations, *see* page 60.

Cerf island, separated from the fringing shore reef on its southern and western sides by the Cerf passage, is nearly a mile long W.N.W. and E.S.E. by 6 cables wide, occupies nearly all the southern end of the reef, and is covered with cocoanut trees, except the northern summit, 270 feet high, and grassy; and the southern summit, 347 feet high, with a few bushes only. The reef extends from 100 to 300 yards into the channel from the south-western side of Cerf island. Faon islet, 78 feet high, stands on the reef, barely separated from Cerf island, at its southern end.

Harrison rocks (*Lat. 4° 38' S., Long. 55° 32' E.*).—This group occupies a space about $1\frac{3}{4}$ cables in extent in all directions, and the highest rock, 28 feet, is near the northern side of the reef. Outside the line drawn round these rocks on the chart there is no danger.

Chart 1072, Mahé island and approaches.

Anonime island is on the southern side of the entrance to the Cerf passage, and its reef is only separated by a narrow and intricate boat passage from that on which South-east island stands; it is about 2 cables long, North and South, by half that width, covered with cocoanut trees, and has a boulder at its summit 130 feet above high water.

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Chart 1072, Mahé island and approaches. Var. 2° 40' W.

South-east island stands one cable north-eastward of La Rue point, but there is no passage between it and the point at low water; it is 4 cables long North and South, and 2 cables wide. A hummock at the southern end is 205 feet high, and nearly bare; another at the northern end is 194 feet high, and has large boulders on it; in the hollow between these mounds stands a large and conspicuous house. Rat islet, lying on the north-eastern edge of the reef, at 3 cables North of South-east island, is 40 feet high and covered with scant scrubby vegetation. There is, at high water, a boat passage between South-east island and the shore, leading into the channel before mentioned southward of Anonime island.

Tortue rock, 3 cables eastward of Rat islet, dries 2 feet, and the sea generally breaks heavily on it; but in calm weather, about high water, it is sometimes scarcely visible. Beacon island, open eastward of the Harrison rocks N.N.W. $\frac{1}{4}$ W., leads to the eastward of Tortue bank, but is a close mark.

Plan 722, Approaches to Port Victoria.

Depths.—The general depths in the immediate neighbourhood of the islands just now described, and also in the passages leading to the outer anchorages as well as into the inner harbour, may be said to be from 7 to 12 or 14 fathoms; but, as is usual with all coral formation, great irregularities are rather the rule than the exception, and shoal patches of from 2 to 4 fathoms are dotted about in all directions when once the channels are entered or the anchorages approached, rendering any attempt at description of the shoals both useless and confusing.

Channels.—Three channels lead in to the outer anchorage and up to the inner harbour entrance; they are the Cerf passage, St. Anne channel, and the North entrance.

Cerf passage.—Of this, the southern entrance, it is sufficient to say that although, if buoyed, there is water enough for vessels of the deepest draught, and plenty of room for its navigation, yet, that having neither buoys nor marks, and having many shoals and coral heads of 2 fathoms, with no part in which a straight course can be steered for any considerable distance, it is not a desirable channel for any vessel to attempt.

St. Anne channel.—This passage between St. Anne, Mayenne, and Round islands is not considered safe for vessels drawing more than 12 feet without the assistance of a local pilot; though clear and deep at its entrance, it has nothing better than $4\frac{1}{2}$ fathoms at its western end, with many shoal heads and patches of from $2\frac{1}{2}$ to 3 fathoms, none of which are buoyed.

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North entrance.—This is the principal channel, buoyed and lighted, and the one in general use by shipping, having water sufficient for vessels of any class and for which directions are presently given.

LIGHT (*Lat. 4° 37' S., Long. 55° 31' E.*).—From a white tower, 42 feet high, standing 70 yards inside the North extreme of the coral reef forming the southern side of the harbour channel, is exhibited, at 37 feet above high water, a *fixed red* light, visible in clear weather from a distance of 8 miles.

For arcs of visibility, *see* Light list and charts.

Lights are also shown on the two chequered buoys and also on the mooring buoy when mail steamers are expected.

Landmark.—A slaughter-house, painted white, lies N. 76° W. distant 7½ cables from the lighthouse; it forms a good landmark.

Buoys.—A small black buoy marks some shoal patches 5 cables westward of St. Anne island; it lies in a depth of 3¾ fathoms, from which position the summit (847 feet) of St. Anne island bears N. 86° E. distant 8¾ cables.

A red and white chequered buoy lies in a depth of 5 fathoms, from which position the summit (847 feet) of St. Anne island bears S. 85° E. distant 11¼ cables.

Another buoy of the same description is situated about 7 cables south-westward of the preceding one; its position is moved according to the monsoon; during the N.W. monsoon it is moored just on the bank; during the S.E. monsoon it is moored to the southward, with the lighthouse bearing S. 62° W. distant 5½ cables.

A black buoy marks the southern side of the channel; from it the lighthouse bears S. 77° W., and is distant 3½ cables, and a mooring buoy is situated nearly in mid-channel in a depth of 13 fathoms, from which position the lighthouse bears S. 74° W. distant 6 cables.

Caution.—These buoys are small and very hard to see.

Directions.—If approaching from the southward or eastward, after passing outside and northward of St. Anne island, which is steep-to on the northern side, bring the lighthouse to bear S.W. ¾ W.; the outer chequered buoy will then be nearly in line with it. Steer in on that bearing, passing eastward of the chequered buoy. The course should then be towards the mooring buoy, if taking up an anchorage outside.

When approaching from the northward, bring the outer chequered buoy in line with or a little open westward of the white sand-beach on the western side of Cerf island, bearing about S. by E. Steer in on that bearing and pass eastward of the buoy; from thence as before directed.

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Plan 722, Approaches to Port Victoria. Var. $2^{\circ} 40'$ W.

In all cases, keep a good look-out from aloft for shoal coral patches.

Outer anchorage.—The first safe anchorage is on the north-western side of St. Anne island, in about 9 fathoms; with the northern end of that island bearing N.E. by E. $\frac{1}{2}$ E., and the south-western end touching the northern end of South-east island (seen between Long and Cerf islands) bearing S.S.E. $\frac{3}{4}$ E. The lighthouse from that position bears about S.W. by W. $\frac{1}{4}$ W., and it may be approached on that bearing until the peak of St. Anne island, 847 feet, bears E. $\frac{1}{2}$ N., when another anchorage may be taken up in from 10 to 12 fathoms. The first anchorage is outside the two outer buoys, the second within them. The coral patches in the vicinity require to be guarded against by conning from the mast-head.

A third and more convenient outer anchorage is in about 10 fathoms, $2\frac{1}{2}$ cables eastward of mooring buoy, with the buoy and lighthouse nearly in a line S. 74° W. In this neighbourhood also are several rocky patches.

These three anchorages are open to the northward, and the swell is sometimes felt. South-easterly winds seldom blow hard, and during the South-east monsoon vessels may lie at single anchor with short scope; but in the North-west monsoon heavy gusts come off the high land.

By night, an anchorage north-westward of St. Anne island can be picked up by a bearing of the light, the bold peak of St. Anne island presenting a good object for a cross bearing, but a stranger should not attempt to pass within the outer buoys.

The INNER HARBOUR of PORT VICTORIA is a basin in the coral reef of irregular shape. The deep-water channel into it is 200 yards wide in the narrowest part between the reefs, which have well-defined and steep edges. In entering, the channel curves from W. by S. to S.S.W.; and when within, the harbour opens in all directions into narrow but deep gullies and creeks in the shore reef.

With the two following exceptions, the harbour is clear of detached rocks, viz.: One of 15 feet E. $\frac{1}{2}$ N. distant 180 yards from the northern end of the coal wharves, and another of 14 feet E. $\frac{1}{2}$ S. distant 210 yards from the southern end of Victoria pier-head; these are both small and not easily seen. The most convenient anchorage is opposite the coal store.

Beacons.—The channel into the inner harbour, and the inner harbour, is marked by beacons, six on the northern side

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Plan 722, Approaches to Port Victoria. Var. 2° 40' W.

painted with red and white chequers, and five on the southern side painted black. The outer beacon on the northern side is situated N. 16° E. a distance of 650 yards from the lighthouse, and consists of a pyramidal framework, surmounted by a ball; the remainder of the beacons are masonry pillars with conical tops; each pillar has an anchor, with a ring, built into its base, for warping purposes.

Directions.—If proceeding to the Inner harbour pass between the inner chequered buoy and the mooring buoy, and the course may then be directed between the beacons marking the entrance channel.

Boats or small craft proceeding up the creek to Hodoul pierhead must leave on the starboard hand the red and white chequered beacon marking the edge of the reef on which the Victoria pier stands, and on the port hand Coal island; then pass between two large perches which mark the best water up to the pierhead. Nothing less than 7 feet should be passed over in this narrow winding creek.

Tides.—It is high water, full and change, at Port Victoria at 4h. 32m.; springs rise from 3½ to 5 feet; neaps 3 feet. The height of the tide is affected by diurnal inequality, which is, however, mainly confined to high water, the maximum observed difference between two successive tides being 2½ feet, when the moon's declination was at its greatest. The sequence of the two tides throughout the lunation is from the higher high water to the lower low water.

A datum mark is cut on the North corner of the Harbour Master's boathouse, at the end of the Hodoul jetty; it is 8 feet 8½ inches above mean sea level; the soundings on the chart are reduced to 11 feet 10 inches below that mark.

Victoria pier, 1,050 yards long and 7 yards wide, extends across the shore reef on the western side of the Inner harbour; at its end are situated the coal wharves, a turtle pond, and a small patent slip (*see* Appendix IV.); midway between the pier end and the shore are engineering works, with a frontage to the deep-water channel. Vessels can lie alongside the coal wharves where there is a depth of from 4 to 6 feet at low water, but they require careful mooring and fending off to keep them clear of the reef which projects under water. There are ring-bolts but no bollards for securing; there are landing steps on the southern side of the coal sheds.

The Hodoul jetty at the head of the creek, on the southern side of the Victoria pier, is about 230 yards long.

Signals.—**By day.**—International flag B, hoisted at Signal hill, and repeated at the Port Office, Hodoul jetty, indicates:—"Mail from Europe in sight." BV—"Mail from Australia." BQ—"Mail from Mauritius." A ball is also hoisted at the Port Office, dipped to

General charts 721, 2899, 748b.

Plan 722, Approaches to Port Victoria. Var. 2° 40' W.

half-mast when the mail is landed, and hauled down at the time of delivery.

By night.—Arrival of mails are indicated by lights shown at the Port Office, as follows:—*White*—From Europe. *Red*—From Australia. *Blue*—From Mauritius. When the mails are landed the lights are lowered half-mast and hauled down entirely at the time of delivery.

By day.—Vessels are signalled at the Hodoul jetty according to their rig:—

A ball at the yard arm for ships.

” ” middle halyards for barques. .

” ” inner halyards for brigs and schooners.

British ships of war are indicated by the Union Jack, and foreign ships of war by International flag H.

Climate.—The climate of the Seychelles generally is given on page 42. The town of Victoria is less healthy than the country, there being as yet no general system of drainage and an indifferent though improved water supply.

Supplies.—Coal.—Baty, Bergne, & Co. (Cory Bros. & Co., London) are the coal contractors; 2,000 tons are imported annually, and 2,000 tons kept in stock. The coal wharves have a total frontage of 700 feet, and there is a depth of from 4 to 6 feet water alongside at low water. The total capacity of the coal lighters is 330 tons. The contractors can put on board, with their own labourers, 600 tons a day, except when mail steamers are in port.

Meat is not plentiful; goats are almost the only domestic animals which thrive; beef is scarce, mutton unobtainable; pork and poultry are cheap; fish is both cheap and good, except a species resembling the sardine, which is poisonous. Green turtle of fine quality are caught from November to April, and are kept in ponds until required. Land tortoises are scarce. Vegetables and fruit are plentiful.

There is an ice and soda water factory.

Water.—A water-boat, with steam pump, is capable of supplying excellent water at about 30 tons an hour.

A water rate of 50 cents per ton is levied on vessels supplied with fresh water by lightermen and others.

Tugs.—One Government and two privately-owned tugs are available.

Repairs.—Repairs to steam and sailing vessels are undertaken at the engineering works, Victoria pier.

In 1910 the ss. *Tai-wan*, which lost her tail-end shaft and propeller, had her defects made good by the company.

General charts 721, 2899, 748b.

Plan 722, Approaches to Port Victoria. Var. 2° 40' W.

Trade.—The total tonnage of shipping which entered and cleared the port, 1908-1909, was 292,304 tons, of which Great Britain supplied 24 per cent., France 38 per cent., and Germany 29 per cent. The principal exports are copra, cocoanut products, guano, and vanilla. The total value of all exports in 1910 was Rs. 22,42,730, of which United Kingdom took Rs. 5,33,663; British possessions, Rs. 75,316; foreign countries, Rs. 15,33,781. The imports are extremely varied, nearly everything required for daily use being imported. The total value of all imports in 1910 was Rs. 14,76,933, of which United Kingdom supplied Rs. 4,03,736; British possessions, Rs. 7,83,980; foreign countries, Rs. 2,89,217 (of which France supplied 80 per cent.).

Custom-house, port, and quarantine regulations.—

All sailing vessels must give 24 hours' notice at the port office previous to departure, and steam vessels 6 hours; mail steamers are exempt. A copy of the quarantine regulations is placed on board each vessel on arrival. Vessels must not enter the harbour until they have received pratique or have been boarded by an authorised pilot, under a heavy penalty. All vessels less than 21 days out of port, and arriving at Seychelles without a bill of health (which should have the *visé* of a British consul if there be one at the port of departure), have to undergo quarantine of observation. Pratique must be obtained at Port Victoria before visiting any of the other islands, but permission may be given vessels, that carry a clean bill of health and have no infectious disease on board, to communicate with one or more of the other islands and there receive pratique before, after, or in lieu of receiving the same at Port Victoria, Mahé; provided that no vessel shall land any passenger on any island before receiving pratique at Port Victoria. The health officer may admit vessels to "partial pratique," which is a modified form of pratique. The quarantine station and lazaretto are on Long island. See page 54.

Hospital.—There is a public hospital at Port Victoria; the charge for first-class patients is six shillings and for second-class patients three shillings per diem.

Chart 1072, Mahé island and approaches.

SILHOUETTE ISLAND (*Lat. 4° 30' S., Long. 55° 14' E.*) lies W.N.W. 12 miles from North point, Mahé; it is 3 miles long N.W. and S.E., 2 miles wide, mountainous, and covered chiefly with cocoanut trees, though other wood is found, but is rapidly decreasing in quantity. The inhabitants, about 300 in number, are chiefly employed in the manufacture of cocoanut oil, of which a large quantity is made, and many crushing mills are in use. At 3 miles westward of Silhouette there is said to be an extensive bank over which the least depth found was 7 fathoms.

General charts 721, 2899, 748b.

Chart 1072, Mahé island and approaches. Var. 2° 30' W.

The highest part of Silhouette island is a ridge about one mile from the northern end, with two summits; of these, Mon Plaisir, the western summit, is 2,467 feet high, and the eastern, 2,404 feet. It is very precipitous on its southern side, which, with the hills on the eastern and southern sides of it, form an amphitheatre, enclosing a valley thickly planted with cocoanut trees. Round peak and Castle peak are 2,046 and 1,691 feet high respectively; they are the most conspicuous summits on the eastern range, which rises abruptly from the sea.

The southern side of the island presents to the view long shelving faces of rock, descending from a considerable height to the water's edge; the coast is everywhere fairly steep-to, having from 20 to 30 fathoms at 5 cables from it, except where a bank with from 10 to 20 fathoms stretches off in the direction of North island.

Anchorage.—The best anchorage is on the eastern side northward of Haddon point, off a reef which is steep-to and awash at high water. Landing may generally be effected at La Passe, a gap in the reef opposite the planter's house, northward of Haddon point, where also is a small village.

Anchorage may also be had at Grande Barbe on the south-western side of the island, and landing can sometimes be effected at the lagoon on the southern side of the sandy beach of that day.

Supplies.—Pigs in great numbers are bred on the island and fattened on the refuse of cocoanuts, a ready market being found for them at Port Victoria. Fowls and ducks are also to be obtained.

North island, 704 feet high at its northern end, lies $3\frac{3}{4}$ miles northward of Silhouette. When seen from the northward, it has a bare desolate appearance, only a few straggling trees showing near the summit. The settlement is on the north-eastern side, where there is anchorage in 15 fathoms but rather close in-shore. Landing is difficult in ships' boats, but native canoes are always available.

Between North point, Mahé island, and the corresponding point of Praslin island are the following islets, rocks, and shoals:—

The **Brisans rocks** lie about half-way between North point, Mahé, and Mamelie islet; they are two in number and lie N.W. and S.E. of each other, the north-western rock being 20 feet high. There are several 8-fathoms patches in that vicinity, but a very careful search failed to find less water. The passage is thus clear all round them.

Mamelie islet (*Lat. 4° 29' S., Long. 55° 32' E.*) is $7\frac{1}{2}$ miles north-eastward of Mahé; it is a small rocky cluster $2\frac{1}{4}$ cables in length, presenting two distinct summits with a low dip between them: the southern and highest part is 140 feet above high water. It

General charts 721, 2899, 748b.

Chart 1072, Mahé island and approaches. Var. 2° 30' W.

appears white, and is the breeding place of numerous sea birds. There is fairly good landing during moderate weather in the small bay on the north-western side.

A group of rocks, on which the sea generally breaks, lies $2\frac{1}{2}$ cables W. by S. from the highest part of Mamelle islet.

LIGHT.—On the summit of Mamelle islet, from a grey tripod, 35 feet in height, is exhibited, at an elevation of 165 feet above high water, a *fixed white* light, visible in clear weather from a distance of 17 miles.

Madge or Blanchisseuse rocks, which cover at high water, lie N. by E. $\frac{3}{4}$ E. distant $4\frac{3}{4}$ miles from Mamelle islet. There are two rocks, 2 or 3 cables apart N.E. and S.W. from each other. St. Anne island summit well open westward of Mamelle islet leads westward of these dangers.

Trompeuse rocks, S. 51° W. distant $2\frac{3}{4}$ miles from South Cousin island, and N. 70° E. 3 miles from Madge rocks, are a group of 6 or 7 rocks lying in an E.S.E. and W.N.W. line, and are 6 feet above high water; they are often mistaken for the Madge rocks. Vessels are recommended not to navigate between the Trompeuse rocks and the South Cousin island, the channel being reported foul and unsafe.

Cousin islands are two small islets, 252 and 215 feet high, $1\frac{1}{4}$ miles apart and bearing from each other N.E. and S.W. The South Cousin is 3 miles from the south-western side of Praslin island. The channel between the islands is safe, as is also that between the North Cousin and the shore reef of Praslin. At $1\frac{1}{4}$ miles N.W. $\frac{1}{2}$ W. from the North Cousin is a rocky coral patch with from $2\frac{1}{2}$ to 4 fathoms water.

Shark and Alligator rocks are both above water, bearing N.N.E. and S.S.W. from each other, and between 2 and 3 cables apart; they lie about $2\frac{1}{2}$ miles southward of the southern point of Praslin island. A 4-fathoms coral bank, $1\frac{1}{2}$ cables long and 50 yards wide, lies W. $\frac{1}{3}$ N. about 9 cables from the Alligator rock. The South points of la Digue and Mary Anne islands in line E. by N. $\frac{3}{4}$ N. leads 4 cables southward of these rocks.

Caution.—In the channel between Mahé and Praslin the lead does not give sufficient warning of proximity to any of the shoals.

PRASLIN ISLAND, the next in size and importance to Mahé, of the Seychelles group, lies 20 miles north-eastward of that island; it is 8 miles in length, with an area of 27 square miles; a range of hills runs the whole length of the island, with many spurs extending on either side. The highest part, near the centre, attains a height of 1,261 feet. The lower parts are covered with trees, among which is the *coco de mer*, or double cocoanut, formerly found only on Praslin and Curieuse islands; two nuts grow in one shell, and the wood is

General charts 721, 2899, 748b.

Chart 1072, Mahé island and approaches. Var. 2° 30' W.

nearly indestructible. The assistant medical officer for Seychelles lives on Praslin island, and there are two outdoor Government dispensaries.

The leper asylum is on Round island, a small island at the entrance to St. Anne's bay on the east end of Praslin island. On the south-western side of Praslin island, the fringing reef extends nearly 2 miles from the shore opposite the deepest bight, and several small islets and rocks lie westward and northward of the island, amongst which may be noticed a small rock only 3 feet above high water, $1\frac{1}{4}$ cables N.E. $\frac{3}{4}$ E. from Millers point, the north-western extreme of the island.

There is no safe anchorage southward of Praslin between the months of May and November. In December, 1870, H.M.S. *Teazer* found good anchorage in the first small bay southward of the Grande Anse. La Blague bay, on the northern side near the eastern end, is deep, and may be approached with safety.

There is a regular fortnightly service, by Government steam launch, between Mahé and Praslin and La Digue islands.

Plan 723, Bay of Curieuse.

Curieuse island (*Lat. 4° 17' S., Long. 55° 43' E.*) is a small island rising to a height of 551 feet and lying northward of Praslin; it is about 2 miles long and one mile wide, the ridge of hills extending its full length from East to West. The south-western side of the island is foul, and depths of less than 4 fathoms extend $2\frac{1}{2}$ cables into the channel between it and Praslin, which, however, has a safe navigable width of about 4 cables, though the *Bonaventure* in passing through in 1896 considered that there was less water than the chart shows.

Curieuse bay.—Shoals.—On the foul ground extending south-westward from Curieuse island is a rock, with 2 feet of water over it, $1\frac{1}{4}$ cables from the shore, with 3 fathoms around. St. Pierre islet its own breadth open northward of La Digue island (just showing clear of Praslin island) leads southward of this rock.

A $3\frac{1}{2}$ -fathoms patch lies just eastward of Curieuse island; it bears from the South point of the island E. by N. $\frac{1}{2}$ N. distant 6 cables, and the same distance S.S.W. from the East point.

Rocks extend north-westward from St. Pierre islet, and there is a rock nearly awash at low water midway between St. Pierre and Bat islands.

Anchorage.—Good anchorage can be obtained at all seasons in 9 or 10 fathoms, with the East and South points of Curieuse island in line N.E. $\frac{1}{4}$ E. and the North extreme of Praslin island bearing N.W. by W.

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Plan 723, Bay of Curieuse. Var. 2° 30' W.

There is a boat passage through the reef westward of Bat island leading to a good landing.

Water can be procured at the south-western part of the bay, but boats can only approach the watering place at high tide.

Tides.—It is high water, full and change, in Curieuse bay at 5h. 10m.; springs rise 7 feet.

Aride and Booby islands.—The first named is an island about one mile long, East and West, and 443 feet high; it lies N. by W. about 5 miles from Praslin. Booby island lies about midway between the two on the same bearing; it is a small barren rock 92 feet high.

Adriens shoal, of $3\frac{1}{2}$ fathoms, is stated to lie with Aride and Booby island in line, about midway between Booby island and Millers point, Praslin island; its position, however, has not been accurately determined, and it is accordingly shown on the chart as *position doubtful*.

Whale rocks, consisting of two separate heads, are very dangerous and uncover about half tide; they lie N. $\frac{3}{4}$ W. distant $2\frac{1}{4}$ miles from the North Counsin, and West distant $1\frac{1}{2}$ miles from Millers point, Praslin.

Chart 1672, Mahé island and approaches.

LA DIGUE ISLAND (*Lat. 4° 21' S., Long. 55° 50' E.*) lies E.S.E. distant $2\frac{1}{2}$ miles from the eastern extreme of Praslin; and is the next in importance to that island, having a population of over 800; it is of triangular form, its greatest length from North to South is nearly 3 miles, and it rises to a height of 1,071 feet above the sea. On the western side the island is fringed by a reef extending 4 cables from the shore, leaving a deep channel between it and Praslin 2 miles wide, but with a dangerous shoal, presently described, in the middle. The eastern and southern shores of the island appear to be free from reef.

Ave Maria rock is a small islet, 57 feet high, lying E. by N. $\frac{3}{4}$ N. distant $1\frac{3}{4}$ miles from the eastern point of Praslin; it is surrounded by a reef extending about one cable.

Roches Canales or Wash rocks.—This dangerous cluster of rocks, about 4 cables in extent and nearly circular in form, lies in mid-channel between the eastern point of Praslin and the North extreme of La Digue island; the northern rock is awash, and the southern rock dries 4 feet at low water springs, but when covered they are difficult of detection, as there is deep water close to; great caution is necessary when in their vicinity or if intending to anchor off the establishment on La Digue island. The South extreme of

General charts 721, 2899, 748b.

Chart 1072, Mahé island and approaches. Var. 2° 30' W.

Félicité island open of the North extreme of La Digue leads to the northward of these rocks.

Félicité island is the largest of the group of islands and rocks lying north-eastward of La Digue island, between which and it there is a clear passage $1\frac{5}{10}$ miles wide. Félicité island is $1\frac{1}{2}$ miles long N.W. and S.E., 747 feet high, and produces takamaka timber, which is Government property. The settlement is on the north-western point, and there is anchorage in a small bay between the island and the Albatross rocks northward of it, in 9 fathoms, at $2\frac{1}{2}$ cables off-shore. The Albatross rocks, with an islet in their centre, appear to cover a space 5 cables in diameter.

Mary Anne island is about 2 miles eastward of Félicité island. It is about one mile long, North and South, very narrow, steep-to, and rises to a height of 425 feet.

The Sisters.—These two narrow rocky islets, each nearly a mile long, and the nearest 5 miles eastward of Praslin, are separated from each other by a deep channel $2\frac{1}{2}$ cables wide. The East Sister is 371 feet in height, the West Sister 347 feet.

A $1\frac{1}{4}$ -fathoms shoal lies about one mile N.W. from the West Sister; it is marked *P.D.* on the chart, as its position has not been accurately fixed. There is also a 6-fathoms patch in the northern entrance to the passage between the Sisters, with much deeper water around it.

Frigate island (*Lat. 4° 35' S., Long. 55° 56' E.*) is the easternmost of the Seychelles group, and is $1\frac{1}{2}$ miles long and 400 feet high; it is well cultivated with the sugar cane, the establishment being on the eastern end of the island, where sugar is made and rum distilled for consumption in Mahé.

There is good anchorage on the north-eastern and also on the south-eastern side of the island; the latter is used during the North-west monsoon. The *Teazer* found good holding ground in from 8 to 11 fathoms at from $2\frac{1}{2}$ to 7 cables northward of the Pyramid rock, at the eastern extreme of the island. Care and knowledge of the passage through the reef is necessary to effect a landing, the reef appearing to the eye at a short distance as one unbroken line. Wild pigs and pigeons were abundant at the time of the *Teazer's* visit.

Reefs on which the sea breaks are said to extend from the northern and south-western parts of the island; Noddy rock, awash at high water springs, and on which the sea generally breaks heavily, lies about 6 cables northward of the North extreme of Frigate island; and L'Ilot, 80 feet high, $1\frac{1}{2}$ miles W.S.W. from that island. (The relative position of this island is doubtful.) Barracouta rock, which apparently breaks, lies about 4 cables eastward of L'Ilot.

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Chart 1072, Mahé island and approaches. Var. 2° 30' W.

Chimney rocks lie S. by E. $\frac{3}{4}$ E. distant $5\frac{1}{2}$ miles from the South point of La Digue island, and nearly 8 miles N.N.W. $\frac{1}{4}$ W. from Frigate island; they are 20 feet high, are easily seen, and have no off-lying dangers.

Renommée rock covers at half flood and lies W.N.W. distant $1\frac{1}{2}$ miles from the Chimney rocks.

Recif island (*Lat. 4° 35' S., Long. 55° 46' E.*) is 10 miles W. $\frac{1}{2}$ N. from Frigate island and 15 miles eastward of the outer islands of Port Victoria; it is half a mile long, 156 feet high, has a remarkable white rock like a building on its summit, is the resort of innumerable sea birds, and is uninhabited. Anchorage has been taken up in 17 fathoms, sand and shells, with the island bearing S.S.E. $1\frac{1}{4}$ miles. Submerged rocks extend south-eastward and south-westward nearly 5 cables from the southern point, and one rock is 15 feet above water.

The bottom between Recif island and St. Anne being very uneven, eddies and ripples are frequently met with.

Chart 721, The Seychelles group, &c. Var. 3° 0' W.

Platte island (*Lat. 5° 52' S., Long. 55° 24' E.*).—This low wooded island lies 64 miles S. by W. from the South extreme of Mahé, and is separated by deep water from the south-western side of the Seychelles bank. It is about a mile in length, N.N.W. and S.S.E., is inhabited, and produces guano and cocoanuts; it is visible 10 or 12 miles distant.

Extensive barrier reefs, on which the sea breaks heavily, surround the island, extending 3 miles from the coast on the northern and western sides. There are two intricate passages through the reef on the north-western side, suitable for small vessels only; the water is quite smooth within the basin formed by the barrier reef, thus rendering landing safe and easy. In 1825, H.M.S. *Ariadne* anchored in 9 fathoms, with the N.E. extreme of the island bearing East distant 2 miles; between this anchorage and the island were many 9-foot coral heads. H.M.S. *Teazer* anchored about 2 miles westward of the island in 5 fathoms. There is also anchorage off the south-western side.

La Perle reef.—A dangerous shoal known as La Perle reef, said to have 12 feet least water, lies about 12 miles S.W. by S. from Platte island, and was examined by H.M.S. *Shearwater* in 1875. The reef appeared to be about 3 miles in length N.N.W. and S.S.E. and of but little width; no dry sand or rocks were visible. A small isolated patch has been reported a mile or two farther westward, but it was not seen by the *Shearwater*. That vessel anchored in $7\frac{1}{2}$ fathoms, $1\frac{1}{2}$ miles from a long line of breakers, but the swell was too heavy to allow a boat to venture within several hundred yards of the surf, at

General charts 2899, 748b.

Chart 721, Seychelles group with outlying islands. Var. 3° W.

which distance there were 4 fathoms. . The breakers were not continuous, and were observed especially in three spots about a mile apart.

La Perle reef appears to be on the southern extreme of the same bank of soundings as that on which Platte island stands; on this bank 14 fathoms was obtained. Commander Wharton placed the centre of La Perle reef in lat. $6^{\circ} 1' S.$, long. $55^{\circ} 17\frac{1}{2}' E.$

Le Constant bank, which may be and probably is a prolongation of the Seychelles bank, was discovered in 1844 by a French vessel of that name; the least water found was 11 fathoms, coral, and other soundings increased to as much as 27 fathoms. The 11-fathoms patch was placed in lat. $6^{\circ} 19' S.$, long. $56^{\circ} 22' E.$, but in 1894 H.M.S. *Lapwing* found 28 fathoms at this position; it is therefore marked *P.D.* on the chart. The bank was said to extend from 12 to 15 miles North and South, and 18 or 20 miles East and West. In 1897, H.M.S. *Stork* sounded southward of the alleged position of the 11-fathoms patch, and found from 25 to 28 fathoms for a distance of 15 miles, when it rapidly deepened to 69 and 331 fathoms, this being evidently the southern end of the bank.

Adelaide bank is supposed to lie 36 miles E.S.E. from Le Constant bank, but its existence is considered doubtful, and it is so charted.

AMIRANTE ISLANDS. — GENERAL DESCRIPTION.*—The Amirante bank, of coral and sand, extends continuously about 89 miles in a N.N.E. and S.S.W. direction, with a width of 23 miles at the southern end, diminishing irregularly to 5 miles at the northern end, the whole being comprised between lats. $4^{\circ} 51' S.$ and $6^{\circ} 17' S.$; and longs. $52^{\circ} 50' E.$ and $53^{\circ} 24' E.$ This submerged bank has a decidedly irregular surface, with masses of growing coral and nullipores all over it; it nowhere attains a greater depth than 37 fathoms, and on its edges, where nullipores flourish, it shows the greatest tendency to growth. The bank probably rises from a depth of about 700 fathoms, all round except the north end, to the 50-fathoms line. It has 11 patches of surface reefs and seven islets.

The group was originally discovered about 1770 by French mariners, and was partially examined and charted in 1821-2 by Captain Moresby and Lieutenant Hay of H.M.S. *Menai*; the positions of the islands and the limits of the banks were accurately determined by Captain Maclear, H.M.S. *Alert*, in 1882.

* J. Stanley Gardiner, M.A., *Geographical Journal*, 1906.

Chart 721, Seychelles group with outlying islands. Var. 3° W.

The group is under the Seychelles Government, who own African banks and Eagle island to the north, and Marie Louise island, Ile des Noeufs, Boudeuse, and Etoile cays to the south; all these are guano producing. The other islands are privately owned in Seychelles. With the exception of Boudeuse, Etoile sand-cays and Ile des Noeufs, all the islands are permanently inhabited and planted with cocoanut trees; they are all flat coral islands, and none are more than 10 feet above water, but are visible, usually, from 10 to 14 miles, according to the height of the cocoanut or casuarina trees on them.

In general navigation, the bank should be avoided, the land being low, the coral patches, as usual, so steep to that the lead gives little or no warning, and the currents are both strong and uncertain in direction; to which may be added that anchorage when obtainable is generally untrustworthy.

Wind and weather, &c.—During the *Alert's* visit to these islands in the months of March and April, and whilst examining the bank, the weather was almost uniformly fine, light winds and calms being prevalent with occasional rain squalls, the latter as a rule at night. For remarks on Tides, *see* page 76.

Plan of African islands on 724.

AFRICAN ISLANDS (*Lat. 4° 52' S., Long. 53° 23' E.*), at the northern end and eastern side of the Amirante bank, at each end of a reef of coral and sand, $2\frac{1}{2}$ miles in length, North and South, and one mile wide, are two small islets, about 10 feet above high water, covered with bush; their formation is probably due to a piling up by the sea of reef material; at low water springs they are connected by a dry ridge of sand. The southern islet is about 500 yards long, is the larger of the two, and has a well-built wooden house on it where four fishermen and their wives live permanently. A good well is said to exist near the house. In 1905 there were three cocoanut trees growing on the northern island and one on the southern, rendering them visible from a distance of about 8 miles. The islands are visited from Mahé about every two months.

At one mile eastward and also northward of the islets there is no bottom with 100 fathoms; but westward a level bank extends 4 miles, with from 10 to 17 fathoms, when it suddenly deepens to 160 fathoms. A heavy surf beats on the south-eastern side during the S.E. monsoon, and there is frequently a heavy sea off the northern end of the bank caused by wind and current.

These islets are very dangerous to make when bearing westward of South; by daylight they may be seen at a distance of about 8 miles, but at night a vessel might be on the eastern reef without seeing

General charts 2899, 748b.

Plan of African islands on 724. Var. 2° 50' W.

them. From the observation spot, on a clear dark night, the breakers could not be seen 3 cables distant, neither could the island be seen from the vessel 8 cables distant under similar circumstances.

Anchorage.—The *Alert* anchored 8 cables westward of North islet in $7\frac{3}{4}$ fathoms, indifferent holding-ground; in that position the vessel was sheltered from the long south-easterly swell, and landing was easily effected, except at low water.

In November, 1887, a German corvette anchored in $5\frac{1}{2}$ fathoms, at one mile N.W. from the South islet; here the anchor could be plainly seen lying on the coral rock. The Commander considered this berth preferable to the other; a schooner much closer in-shore was in quite smooth water.

Current.—A strong current setting to the north-westward makes round the north end of African banks.

Chart 721, The Seychelles group, &c.

Eagle island (Lat. $5^{\circ} 7' S.$, Long. $53^{\circ} 19' E.$), about 13 miles S.S.W. from the southern African island (where the bank is 8 miles wide and the average depth in the intervening space is about 17 fathoms), is nearly circular, three-quarters of a mile in diameter, covered with bushes and coarse grass; it shows a definite upraising of at least 20 feet, being formed of coral rock, and in many places fringed by low cliffs. The island, which belongs to the Seychelles Government, has been worked for guano, and a large heap of the "tailings" remain in front of the settlement, which is situated on the north side of the island, and is surrounded by a large clump of casuarina trees; a manager and 22 labourers are permanently resident there. The island was planted with cocoanut trees in 1905, and is visible from a distance of about 12 miles.

The coast is fringed by a reef, extending 3 cables from the southern side, and about half a cable from the northern side, where there is a steep sandy beach and easy landing at all times during the S.E. monsoon.

Communication.—Eagle island is visited every two months from Mahé.

Anchorage.—H.M.S. *Sealark* anchored in 8 fathoms, about 2 cables from the island, with the east extreme bearing S. 40° E. and the west extreme S. 9° W.; the anchorage appeared to be good, and is much protected by Remire reef.

Water.—The water in the wells is scarce and brackish, but rain water, sufficient except in a dry season, is caught in a tank from the roof of the manager's house.

General charts 2899, 748b.

Chart 721, The Seychelles group, &c. Var. 3° W.

Tidal streams.—With a rising tide the tidal stream sets North to N.E., with a falling tide W.N.W. to S.W.; in each case at the rate of a quarter of a knot at neaps; the westerly stream is weaker and more irregular than the other.

Shoals.—**Remire reef** is the principal danger in this vicinity; the nearest part lies E.N.E. distant $1\frac{1}{2}$ miles from Eagle island, from thence it extends 4 miles north-eastward, with a width of $1\frac{1}{2}$ miles; it dries in patches at low water, and is steep-to on the south-eastern side, on which a heavy surf rolls. There is a passage between the reef and the island, but it should not be taken except in case of necessity.

At 2 miles South of Eagle island is a $2\frac{1}{2}$ -fathoms shoal, and at 3 miles W. by S. a patch, which looks shallow, but the boats of the *Alert* could not find less than 6 fathoms. At 8 miles S.S.W. $\frac{1}{2}$ W. from Eagle island, a depth of 4 fathoms was found on an apparently extensive bank; at 6 miles North there is a 5-fathoms patch, and at $4\frac{1}{2}$ miles N.N.W. $5\frac{1}{2}$ fathoms.

Caution.—Navigation between the African islands and Eagle island should be avoided except in daylight and with fair weather, the ground being foul in patches over the whole area; a good look-out should also be kept from the masthead, as, in favourable weather, the bottom may be plainly seen in 12 fathoms.

Plan of D'Arros and St. Joseph islands on 724.

D'ARROS and ST. JOSEPH ISLANDS.—These islands are leased by the Seychelles Government to Said & Co., Seychelles. There are living on them two managers and about 40 labourers, 12 of whom are on St. Joseph. With the exception of the big clump of casuarinas on D'Arros, all the larger islands are covered with cocoanut trees which are in full bearing.

D'Arros island (*Lat. $5^{\circ} 24' S.$, Long. $53^{\circ} 18' E.$*) lies about S. $\frac{1}{2}$ W. distant 18 miles from Eagle island. The island is one mile long, East and West, by half a mile wide, is of the usual coral reef type, flat, and nowhere more than 10 feet high; the tops of the trees are 86 feet high, showing as a large square clump before the remainder of the island is seen. It is on a separate reef, having a deep-water channel 3 cables wide between it and the atoll on which St. Joseph island stands. D'Arros is surrounded by a fringing reef extending between 2 and 3 cables from the shore except at the south-eastern corner, and also on the northern side near the settlement, where there are 26 fathoms at a cable from the beach. A spit of from 2 to 3 fathoms extends 5 cables north-eastward from the island.

Anchorage.—The best anchorage is north-eastward of the island, off the shoal spit, in 15 to 18 fathoms, with the west extreme of

General charts 2899, 7486.

Plan of D'Arros and St. Joseph islands on 724. Var. 3° W.

D'Arros island bearing S. 54° W., and the east extreme bearing S. 26° E.; the water shoals very rapidly from 35 fathoms. Small vessels anchor closer to the shore, and are said to be completely out of the tides.

Tidal streams.—The tidal stream sets between W.S.W. and W.N.W. from a quarter of a knot to 1½ knots at springs, from two hours after low water by the shore until two hours before the succeeding low water; the remainder of the time it is either slack or setting East and E.N.E. at a maximum rate of half a knot.

Supplies.—No supplies are obtainable, there being only sufficient for the need of the inhabitants.

Water.—There is good water in wells near the beach at the settlement.

Chart 721, The Seychelles group, &c.

Shoals, &c.—At 2½ miles N. by E. ½ E. from D'Arros island there is a 2½-fathoms shoal, apparently extending 4 miles in the same direction, where the depth is 5 fathoms. At 5 miles W. by S. from D'Arros island, 4 fathoms was found on a bank of some extent. Between D'Arros and Eagle islands, the Amirante bank varies from 4½ to 13 miles in width, East and West; it is full of shoals and patches, and must be navigated with great caution. A vessel should always anchor at night in this locality, weather and sea permitting; if not, an offing from the bank should be made.

Plan of D'Arros and St. Joseph islands on 724.

St. Joseph island, lying E.S.E. distant 3 miles from D'Arros island, is a mile long, a quarter of a mile wide, and crescent-shaped, with its concave side to the westward; it is the largest and easternmost of a group of eight islets standing on a coral reef of atoll formation, 3½ miles long N.W. and S.E., by 2 miles wide, and the tops of the trees are 80 feet above high water. On the north-western extreme are a few huts for the people from D'Arros who cultivate the island.

The lagoon of this atoll is 1½ miles long, and 7 or 8 cables wide, with from 7 feet to 3½ fathoms of water. On the western side and just South of a small sandbank 5 cables S.S.W. from Ressource, the northern islet of the group, there is a shallow boat passage, available for small boats at high water; the channel is roughly staked.

Ressource and Fouquet islets are on the north-eastern part of the atoll between St. Joseph and D'Arros islands; they are planted with cocoanuts, as are also Pelican and Chien islands, on the southern side, though not so extensively; the tops of the trees are 40 feet above high water. Benjamin and Carcassaye islands, lying on the southern

General charts 2899, 748b.

Plan of D'Arros and St. Joseph islands on 724. Var. 3° W.

part of the reef, are mere sand-cays covered with bushes, from 10 to 20 feet above high water. Ile Poule is a sandbank on the western side which covers at high water; it has two bushes on it about 10 feet high.

All the islands of the St. Joseph group demonstrate the increase of the lagoon at the expense of the land, as they everywhere show destroyed trees and bushes, and in many places lines of old beaches.

Channel.—The channel, 3 cables wide, before mentioned, between D'Arros and the St. Joseph atoll, is clear and deep, having 30 fathoms in it. The reef extends 5 cables westward from Ressource islet, and the tide runs through the channel between this reef and the spit extending north-eastward from D'Arros island with considerable strength; it has therefore to be taken with care, especially as the edges of the reefs are difficult to make out, unless the sun is in a favourable position.

There is no good anchorage around the St. Joseph group.

Chart 721, The Seychelles group, &c.

Bertaut reef.—This reef, bearing S.W. by S. distant 15 miles from St. Joseph island and N.W. $\frac{3}{4}$ N. distant $6\frac{1}{2}$ miles from Poivre islands, is about 3 miles in diameter; on its southern port is a small sand-cay, and the sea breaks heavily on the steep edge of the reef.

POIVRE ISLANDS (*Lat. 5° 45' S., Long. 53° 19' E.*) are three in number and close to the eastern edge of the bank, standing on a coral reef 3 miles long North and South, by 2 miles wide, the whole of which dries at low tides; they are all leased by the Seychelles Government to Said & Co., but they are not, nor are any of the Amirante islands, worked very energetically. The islands are covered with trees, chiefly cocoanuts; they also have groves of casuarinas, which attain a height of 75 feet above high water, and are visible from the deck at a distance of 12 miles; the southern island is the largest, and the western is a mere islet and very small.

North island.—The establishment is on the north-eastern extreme of North island, in a picturesque grove of casuarinas and bois blanc. The population is 26, with a manager in charge. There is good fishing in the vicinity. In 1882 there were apparently plenty of rabbits and pigeons, but in 1905 none at all were seen.

Anchorage.—The best anchorage is off the western end of North island, where there is a considerable area with about 12 fathoms over it, well sheltered from the S.E. wind and swell, with the north extreme of North island bearing S. 87° E., and the south extreme bearing S. 48° E. Anchorage may also be found, about 2 cables off the reef edge facing the settlement, in from 14 to 20 fathoms, but

General charts 2899, 748b.

Chart 721, The Seychelles group, &c. Var. 3° W.

it is more exposed than the other; there is a white masonry pillar, on shore, facing this position, which was intended as a shore mark for anchoring, but is now almost obscured by trees.

Landing.—There is a good and safe passage through the reef, leading directly to the settlement, opposite the pillar mentioned above, available for boats at all states of the tide; it is cleared of coral lumps, from time to time, and is marked by two wooden perches fixed in the reef, which, when in line, lead straight up the channel. At low water it is necessary to wade a short distance after the boat has grounded, but at high water the boat can go right up to the beach.

The reef, between the islands, dries at low water, but no one lives on the southern island; this island consists of three long spurs, joined at the north end, which were once, apparently, three separate islands. A fourth sand island is now forming to the eastward of the other three.

Supplies.—No supplies are obtainable.

Water.—There are wells, but the inhabitants chiefly depend on rain water.

Communication.—The island is visited from the Seychelles every two months.

Tidal streams.—At the anchorage, first mentioned above, the tidal streams set N.N.E., North, and N.N.W., from three hours before high water to three hours after, at a rate of from a quarter of a knot to one knot, and from southward to westward, for the rest of the time, at a maximum rate of half a knot; there is a short period of slack water between the streams.

Current.—A strong current was experienced by H.M.S. *Pearl* between Ile Desroches and Poivre islands, setting to the north-westward. There were numerous tide-rips.

Etoile cay lies on the western side and near the edge of the Amirante bank W. by S. $\frac{1}{2}$ S. distant $18\frac{1}{2}$ miles from Poivre islands. It is a small sand-cay 2 cables in diameter, on a coral knoll extending 5 cables N.N.W. and S.S.E. There are on its northern edge a few scattered bushes about 15 feet above high water, but no trees.

Boudouse cay, on the south-western extreme of the Amirante bank, lies S.W. by W. $\frac{1}{2}$ W. distant 34 miles from Poivre islands; it is a sandbank $1\frac{1}{2}$ cables in diameter, with some coarse grass on the summit about 15 feet above high water. Shoal water extends 5 cables eastward of the cay; and a bank, with from $4\frac{1}{2}$ to 10 fathoms, stretches away about 6 miles between the bearings N. by E. and N.E. by E. from the cay.

Chart 721, The Seychelles group, &c. Var. 3° W.

Marie Louise island (*Lat. 6° 11' S., Long. 53° 9' E.*) lies on the south-eastern edge of the Amirante bank; it is three-quarters of a mile long, North and South, by one-third of a mile wide, and belongs to the Seychelles Government. There are 21 labourers and a manager living on it, and they are employed working guano and planting cocoanut trees. It is low and sandy, covered with bushes, and fringed with coral reef extending $2\frac{1}{2}$ cables off-shore, on which a heavy surf breaks, so that landing is rarely practicable.

It shows well during daylight, having a conspicuous row of casuarina trees on the north-western side, 90 feet above high water, and when seen on a northerly or opposite bearing they are in line, looking like a square tower, and are in sight some time before the actual land. A small clump of cocoanut trees stands near, but much lower than the casuarinas; as this island is the only one of the southern group having trees on it, they serve well to identify it.

The *Alert* anchored one mile North of Marie Louise island in 17 fathoms; the holding ground is indifferent and the island affords no shelter.

Wreck.—A steamer, which took fire while loading guano early in 1905, lies sunk in the anchorage, and constitutes a serious danger to shipping, as her masts are not visible, being a few feet under water.

A shoal $1\frac{1}{2}$ miles long N.W. and S.E., very narrow, having only 3 fathoms over it, but with a clear passage on either side, lies S.W. by W. distant 3 miles from Marie Louise island, or nearly midway between that island and Ile des Noeufs. The position of this shoal is generally indicated by tide rippings.

Ile des Noeufs lies S.W. by W. $\frac{3}{4}$ W. nearly 7 miles from Marie Louise island and is the southernmost islet of the Amirante group, close to the southern end of the bank. It is three-quarters of a mile long W.N.W. and E.S.E., by a quarter of a mile wide, low and sandy, with coral protruding from the beach slope, and has a few bushes on its north-western side about 18 feet above high water; it is fringed with coral reef extending one mile in a south-westerly direction; the sea breaks in 4 fathoms on a spit a mile farther westward. The island is so low that it is seen with difficulty even by daylight.

Plan of Ile Desroches on 724.

ÎLE DESROCHES (*Lat. 5° 41' S., Long. 53° 41' E.*).—This island lies 21 miles eastward of the Poivre islands, on the southern edge of a coral bank of the atoll character, quite separate from the Amirante bank; the channel between being 10 miles wide and with ocean depths. The bank is nearly circular, 10 miles in diameter, with shallow water round the remainder of the atoll circle on which the

General charts 2899, 7486.

Plan of Ile Desroches on 724. Var. 3° W.

island stands, with the exception of one deep opening about one mile wide at the north-western side, about 8 miles from the centre of the island; and another but much shallower opening about 3 miles wide on the eastern side, with from $3\frac{1}{2}$ to 6 fathoms. The north-western passage is the only one by which a moderate-sized vessel can safely approach the island. Submerged coral knolls on which there is usually much swell, make crossing the bank by the eastern opening, or in any other place, exceedingly hazardous. The depth exceeds 100 fathoms close outside the reef in all directions.

Ile Desroches is $3\frac{1}{2}$ miles long E. by N. and W. by S., by half a mile in width, fringed with coral reef, drying at low water, which extends a full mile from the eastern extreme, and half a mile from the western end and southern side. The island is privately owned in Seychelles; there is a manager and 25 labourers living on it. The island was completely planted in 1865 with casuarinas, which had grown into a forest in 1905, with the tree tops about 120 feet above sea level, though the island itself is nowhere more than 14 feet in height. Cocoa-nut trees are now taking the place of the casuarinas, which are being cut down, and as this felling and planting is taking place from the centre, outwards, the island, at a distance, appears to be divided into two parts, the eastern and western casuarina groves.

Ile Desroches appears to be washing away along its southern side, and also at the western point.

No supplies are procurable, and water is scarce in the dry season. Partridges, doves, whimbrel, and dotterel may be shot in fair numbers, and the fishing is good.

An extensive bed of rocks called the Shark rocks, about 5 miles in length, occupies the northern portion of the atoll, at from 5 to 7 miles northward of Ile Desroches; the general depths appear to be from 12 to 15 feet, but two patches of 9 feet were found on it.

Rock.—Captain Bertaut, of Poivre islands, reported having found a small pinnacle 12-feet rock N.N.E. $\frac{3}{4}$ E. distant 10 miles from Ile Desroches, and that it is distinctly separated from the Desroches bank by a space of at least one mile, there being no bottom at 50 fathoms close around the pinnacle, and none with 100 fathoms close to the Desroches bank.

Directions.—When bound for Ile Desroches, a sharp look-out from aloft is the best guide, the shoal water showing quite plainly. Bring the Settlement to bear S.E., and steer for it on that bearing, observing that the tidal stream sets strongly over the reef and across the pass; a least depth of 9 fathoms may be obtained on the ridge, the water then deepens to 17 and 14 fathoms up to the anchorage.

General charts 2899, 748b.

Plan of Ile Desroches on 724. Var. 8° W.

Anchorage.—The space within the reef is 6 miles in diameter, having from 10 to 17 fathoms water, and appears to be remarkably even and clear of coral heads, considering its formation. The *Alert* anchored in 12 fathoms, N.W. distant 7 cables from the observation spot; in the S.E. monsoon this anchorage is excellent; a slight swell is felt, but no tidal streams. There is no anchorage on the southern side of the island.

Landing can be effected anywhere along the beach at all states of the tide, except in strong north-westerly winds; at such times the islanders use a gap through the reef on the southern side.

Chart 721, The Seychelles group, &c.

Tides and Tidal streams.—The tidal streams appear to be tolerably regular throughout the Amirante group; it is high water, full and change, all over the bank at 5 hours; springs rise about 8 feet. The streams near the islets and shoals take the direction of their edges, but, as a general rule, the flood stream sets north-westward, and the ebb south-eastward, the stream turning at high and low water, and the greatest rate observed being $2\frac{1}{2}$ knots.*

The following are exceptions to the general rule:—At Poivre islands and at Desroches the spring rise is 6 feet, and at Marie Louise it is 7 feet. At the anchorage off the African islands, the flood sets South and the ebb North at about half a knot. At the anchorage off Eagle island, the directions of the streams are South and North as above, but the rate is one knot. Off D'Arros and Marie Louise islands the flood stream sets West and the ebb stream East about 2 knots. Westward of Marie Louise, an eddy is formed during the flood tide which extends about $1\frac{1}{2}$ miles, and sets directly back towards the island. At the anchorage off Desroches, the tidal streams are slight, but near the Shark rocks the flood stream sets north-westward and the ebb stream south-eastward nearly one knot.

Although the *Alert* found the tides regular during the months of March and April, it is not always so; and the tidal streams are sometimes strong and variable. When the ebb stream combines with the general current which runs north-eastward, it may attain a rate of 4 or $4\frac{1}{2}$ knots.

ALPHONSE ISLAND (*Lat. 7° 1' S., Long. 52° 45' E.*) stands near the centre of a coral reef, 2 or 3 miles in extent, at the northern end of a group of sand and coral banks 12 miles long and 5 miles wide, from which it is separated by a narrow but very deep channel, through which the tidal stream runs with great strength,

* H.M.S. *Sealark* found that in the S.E. monsoon the streams did not in all cases turn with high and low water by the shore.

Chart 721, The Seychelles group, &c. Var. 3° 30' W.

forming several eddies. The centre of the island bears S.S.W. $\frac{1}{4}$ W. distant 50 miles from Ile des Noeufs, and the clear channel between it and Amirante bank is 46 miles wide. The island is about 2 miles in length and has on it a clump of casuarinas, but is mainly covered with cocoanut trees. It is under the Seychelles government, and is privately owned in Seychelles. There is a manager and about 20 workmen living on it, cultivating cocoanuts and turtling in the season.

On the southern and south-eastern side of the island is a large basin with a depth of 10 fathoms, the passage in bears South from the centre of the island; this channel is only available for boats when near high water, as it breaks right across at half tide.

No supplies are obtainable, nor water.

Anchorage.—There are two or three spots where it is possible to find anchorage, but all are bad and dangerous, being exposed either to the S.E. swell or to the violent tidal streams through the channel south of the island. One is off the extreme south-east corner of the reef in 20 fathoms; another in 12 fathoms is just eastward of the boat channel leading to the lagoon, and a third, used by small craft visiting the island, lies off the eastern side, where there is another small boat channel over the reef.

Wreck.—There is the wreck of a small wooden vessel lying on the reef slightly westward of the southern boat channel.

Tides and tidal streams.—It is high water, full and change, at about 3h. 0m.

The tidal streams, in the channel between Alphonse and Bijoutier islands, run West and S.W. at a rate, at neaps, of half a knot to $2\frac{1}{2}$ knots, while the tide is falling by the shore, and East to N.E. with the tide rising. There is no slack water, a vessel swings to the new tide in about 5 minutes. Small tide-rips pass through the strait once every hour, and a heavy tide-rip, dangerous to boats, accompanies the change of the stream.

Bijoutier and St. Francois islands.—Bijoutier island is on the northern part of the large reef, just now described, which dries in patches at low water. The island is small and circular, covered with cocoanut trees. St. Francois island is at the south-western end of the same reef, and is a mere ridge of sand about $7\frac{1}{2}$ cables long North and South. Both islands are visible from a distance of about 11 miles. The reef is so shallow that boats cannot pass between Bijoutier and St. Francois at low water. The latter island is cultivated chiefly for cocoanuts by the people of Alphonse island.

General charts 2899, 748b.

Plan of Coetivy island on 724. Var. 3° W.

COETIVY ISLAND (*Lat. 7° 6' S., Long. 56° 17' E.*).—This island was discovered by the Chevalier de Coetivy, in 1771; it was examined by Commander Wharton in 1875, and again by Lieut. Gedge, R.N., in H.M.S. *Stork* in 1897. It is about $5\frac{1}{2}$ miles long, $1\frac{1}{2}$ miles wide, and is covered with cocoanut trees 40 feet high; it has several sand-hills, but none are higher than the trees. The island is under the Mauritius government, and is leased to a firm in Mauritius. There are two white managers and about 140 labourers.

There is no guano deposit on the island.

The exports are cocoanut oil, cocoanuts, and a small quantity of tortoise shell.

The island is fringed by a reef, which, at the southern end, extends 3 miles from the shore; it is dry at low water, and the sea breaks heavily on it, as there is deep water close-to.

The eastern side of the island has deep water everywhere within a mile of the fringing reef, but the northern limit of soundings within the 20-fathoms line on the western side of Coetivy extends $9\frac{1}{2}$ miles W.N.W. from the northern end of the island; the southern limit lies W. by S. $\frac{1}{4}$ S. distant 10 miles and S.W. $\frac{1}{2}$ W. distant 6 miles from the South point. The general depths on the bank are from 13 to 17 fathoms, but in the south-eastern portion there is a considerable area with from 4 to 6 fathoms only, where the bottom may be plainly seen. The edge of the bank falls everywhere precipitously to ocean depths.

Vessels passing southward of Coetivy island should give that end a berth of at least 6 miles to keep clear of all danger.

There is anchorage anywhere on the western side of Coetivy, but the most convenient for communication is off the settlement near the centre of the island. Good anchorage was found by H.M.S. *Pearl* with the S.E. trade blowing, in 6 fathoms, sand and coral, with the huts bearing S. 65° E., and the north-west point of the island bearing N. 35° E.; it is not advisable to anchor nearer the landing place, on account of the coral heads.

Landing.—The coast reef is broken off the settlement, and a boat can land on the sandy beach, but care must be taken to avoid the shoal patches which lie 2 or 3 cables from the coast.

Supplies.—Turtle may be purchased; ducks, fowls, and pigs are plentiful, but there are no vegetables.

Communication.—The island is visited three times yearly by a brigantine from Mauritius.

Charts 721 and 2899.

Fortune bank.—This extensive bank, lying between 25 and 60 or 70 miles eastward of Coetivy, was named after Kerguelen's ship,

General charts 2899, 748b.

Charts 721 and 2899. Var. 3° W.

which anchored on it in 14 fathoms, in September, 1771. The bank has not been sufficiently examined to determine its extent, nor the least water on it, nor whether the depth decreases. The *Surat Castle* sounded over a space included between the parallels 7° 11' S. and 7° 25' S., and the meridians 56° 45' and 57° 15' E.; the least water found was 10 fathoms, coral rock and coloured shells; an appearance of breakers was observed on the western edge of the bank and a short chopping sea all round.

Small vessels on passing over the bank have found 9 fathoms in about lat. 7° 18' S., long. 57° 15' E. Sir Stephen Lushington, while steering East for a distance of 7 miles, found from 10 to 12 fathoms, and could distinctly see the coral and sand bottom. By observation, the latitude was found to be 7° 7' S., and Coetivy to be 31 miles to the westward. About the same part of the bank, in 1866, the *Wasp* found from 13 to 14 fathoms. In April, 1830, the *Abercrombie-Robinson*, Indiaman, found regular soundings of from 10 to 17 fathoms while running 5 or 6 miles N. by E. $\frac{1}{2}$ E. over what was supposed to be the north-western end of the bank, in lat. 7° 6' S. and long. 56° 50' E.

Plan of Agalega islands on 1881. Var. 4° 10' W.

AGALEGA ISLANDS (*Lat. 10° 26' S., Long. 56° 40' E.*).—These are two islands connected by a ridge of sand about a mile in length, which dries at low water. The northern island is about 6 miles long and 2 miles wide, and the southern about 4 miles long and 3 miles wide. They are low, the northern one being about 25 feet high and the southern 15 feet high, but nearly covered with cocoanut and high casuarina trees, which may be seen 15 miles distant. When bearing S.E. or N.W. they appear as one small island, but when at right angles to those bearings they show their full extent.

The islands are easily approached, as there are no outlying dangers; they are surrounded by steep-sided reefs attached to the shore, inside of which there are boat passages; the reefs extend farther on the western than the eastern sides of the island. There is a stone pier, boat-harbour, and flagstaff on the north-eastern side of the southern island near the settlement, where there is an establishment for the manufacture of cocoanut oil under a manager employed by the Agalega Company of Mauritius. In 1904 the total population was 403, and the quantity of oil manufactured was 200,000 gallons. There are no mills employed in this manufacture.

Anchorage.—The steepness of the reef renders it very difficult to find an anchorage. In 1857, H.M.S. *Frolic* anchored on a ledge on the eastern side of the southern island, in 10 fathoms, about 2 cables from the edge of the reef, the bottom being coral and large rocks.

General charts 2899, 748b.

Plan of Agalega islands on 1881. Var. 4° 10' W.

Four mooring buoys are placed about 70 yards from the shore for the accommodation of vessels visiting the place, they are attached to frigates' anchors; two buoys are intended to be ahead and two astern, the vessel being broadside to the beach with her head S.E. A vessel intending to use them should bring the flagstaff to bear S.S.W., anchor in 7 fathoms, sand and coral, and then haul in and secure between the buoys. The ship's stern will then be 50 yards from the pier and 20 yards from the edge of the reef. This position is very open and unsafe; with the wind eastward of S.E. a heavy swell sets in, when a vessel is better under way.

There is a better anchorage than at the moorings in 18 to 20 fathoms, sand and gravel, at about 2 cables north-west of the northern buoys. There is also anchorage in Little Mapou bay in 17 to 20 fathoms at 3 or 4 cables from the reef, in the bight on the western side of the south island.

Vessels bound to Agalega with S.E. winds should get into its latitude well to windward and run down. When the island is sighted, the ensign should be hoisted at the fore truck as a signal that she desires to anchor. An answering pendant hoisted on shore is an intimation that her wish is known, and that boats and assistance will be ready to secure her to the buoys. The vessel should not, however, approach too closely until the answering pendant is replaced by a red ensign with a ball below it. Should the weather not be suitable, the answering pendant is shown with the negative pendant under, in which case the vessel should seek an offing until the weather moderates.

Pilots.—The coxswain of the surf-boat acts as pilot if required, but may not be very competent.

Tidal Streams or Current.—At the *Frolic's* anchorage, the tidal streams ran at from one to 3 knots; the first of the ebb with great velocity. The *Griffon* reported the tides to be irregular, and that correct information was not obtainable. The *Lapwing*, whilst lying-to off the settlement, experienced a strong north-easterly set.

Wind.—The worst months in the year at the Agalega anchorage are July, August, and September, when the South-east trade is strongest and the swell comes more from the eastward.

Landing in ships' boats at the usual landing place is dangerous, and the channel through the reef is difficult at low water, but a surf-boat can be obtained. Landing can be effected by a ship's boat on the north-western side of the northern island.

Supplies.—In 1857, the island abounded with hares, partridges, guinea-fowl, peacocks, wild poultry, and wild pigs; the increased number of inhabitants must have made a considerable difference, but

General charts 2899, 7486.

Plan of Agalega islands on 1881. Var. 4° 10' W.

pigs, poultry, and eggs can still be purchased in small quantities; there are also many pigeons, and some quail. Fish and turtle are abundant.

Water may be procured from wells, though not of good quality.

Communication with the rest of the world is almost entirely dependent on the four-monthly visits of a vessel from Mauritius, in April, August, and December, which brings supplies for the settlement and takes away the cocoanut oil.

Chart 2899.

Bank.—A bank with about 15 fathoms over it is reported to exist at a distance of about 15 miles westward of the northern island. It is stated that in December, January, and February, the fishermen of the islands resort to this bank, from which they can just see the island.

Chart 496, Saya de Malha bank. Var. 5° 20' W.

SAYA DE MALHA BANK.—This extensive bank as now defined shows a distinct deep-water division between its northern and southern parts; the southern bank being by far the larger. The two banks are included between lats. 8° 16' S. and 11° 46' S.; and between longs. 59° 37' E. and 62° 22' E. Their length N.N.W. and S.S.E. is about 234 miles, and the width varies from 20 miles in the northern bank to 120 miles in the southern bank. The banks were partially surveyed by Commander Aldrich, H.M.S. *Fawn*, in 1881, and this survey remains the principal source of latest information.

The Northern bank, to which Commander Aldrich principally directed his attention, is about 78 miles long, North and South, within the 100-fathoms contour line, with a central width of 23 miles, tapering both North and South to points, with a deep-water channel some 15 or 20 miles wide between it and the main body of the bank to the southward.

This northern bank is steep-to, the eastern edge with from 6 to 12 fathoms, and at one spot in about lat. 8° 45' S., long. 60° 12' E. only 4 fathoms, rises abruptly from the bed of the ocean. About 3 miles S.S.E. from the supposed position of the 4-fathoms spot, the Austrian ship *Fasana* took many soundings on a bank of coral 3½ miles long N.E. and S.W., and 2 miles wide, on which the least depth found was 8 fathoms. From the eastern edge, the bank gradually deepens near the western side to 20 and 30 fathoms, and then falls suddenly into deep water; bottom was not obtained within 2 miles of the western edge with 130 and 200 fathoms of line. At 6 miles eastward of the bank, bottom was not reached with 500 fathoms of line. The apparent northern end where the bank is about 2 miles across, with 12 fathoms over it, lies in lat. 8° 18' S.,

General charts 2899, 748b.

Chart 496, Saya de Malha bank. Var. 3° 20' W.

long. 60° 6' E.; at 2 miles north-eastward of which position bottom was not reached with 225 fathoms of line.

Shoal water of 5 fathoms was found near the eastern edge of the northern bank, in lat. 9° 12' S., long. 60° 21' E., with from 6 to 10 fathoms for 16 miles south-westward, dropping very suddenly into no bottom with 220 fathoms. North-eastward of the 5-fathoms patch, for a distance of 6 miles to the edge of the bank, there is a general depth of from 6 to 8 fathoms, with 160 fathoms just off the edge of the bank, and no bottom with 500 fathoms of line at 13 miles farther eastward. It is quite probable that shoaler water than yet found may exist on this bank.

The Southern bank, or main body of the Saya de Malha bank, is much larger than the northern, and chiefly depends for accuracy, as charted, on the survey of Captain Moresby of the Indian Navy in 1837-8. The shoalest water is near the northern and the eastern edges; from which it deepens to anything between 25 and 90 fathoms towards the south-western side, and then to ocean depths. In the northern part of this bank, in lat. 9° 58' S., long. 61° 28' E., are depths of 8 or 9 fathoms over a small area; and nowhere southward of this are depths of less than 10 fathoms known to exist; though, at one part, in the neighbourhood of lat. 10° 50' S., long. 62° E., an unauthenticated depth of 4 fathoms has been reported. At the northern edge, however, in lat., *approx.*, 9° 45' S., long. 61° 25' E., M. Poydenot, of the Messageries steam vessel *Armand Behic*, saw the bottom and sounded in 4½, 6, and 6½ fathoms. So far as known this is the shoalest part of the Southern bank.

Nature of bottom.—The bottom appears to be generally of coral when under a depth of about 33 fathoms, and in deeper water, of fine sand. H.M.S. *Fawn* anchored on the southern bank, in 14 fathoms, in lat. 9° 53' S., long. 60° 51' E., riding easily with 100 fathoms of cable, though there was occasionally a chopping sea. Also, on the northern bank, in lat. 8° 25' S., long. 60° 10' E., in 11 fathoms. Here the bank is only 5 miles wide, dropping suddenly on the western side from 17 to 125 fathoms.

Caution.—On this vast bank there may be shoal patches yet undiscovered, therefore great caution is requisite, and a good look-out should be kept when passing over any part of it. The *Cornwallis* and *Northumberland* found 7 fathoms and the *Preston* 6½ fathoms on the eastern edge, and it has been confidently reported many years ago that there are coral patches at the south-eastern extreme on which a vessel might touch; in this quarter, the French schooner *Eliza* reported the depth of 4 fathoms, near breakers, already referred to.

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Chart 496, Saya de Malha bank. Var. 4° W.

Current.—From observations taken when at anchor, and during surveying operations, the mean direction of the current was found to be a little southward of West, with an average strength of one knot. In the many channels of deeper water between the shoaler parts of the bank, the current is variable, and runs with increased strength; the weakest current is over the shallowest parts.

The deep-water channel between Saya de Malha and Nazareth bank (page 144) is about 100 miles wide, and a westerly current has been known to set through it at from 25 to 50 miles a day.

Tide Ripples.—North-westward of the Northern bank in lat. $7^{\circ} 45' S.$, long. $59^{\circ} 40' E.$, heavy tide ripples and one overfall were observed, probably caused by the meeting of the current from the opposite sides of the bank; bottom was not obtained with 230, 180, and 214 fathoms of line.

Fish.—A plentiful supply of large fish may be caught at anchor on the bank, but the fishermen from Mauritius state that several well-known descriptions of fish, eatable elsewhere, are here found to be very poisonous.

Chart 2899.

Reported breakers.—In the assigned position of “reported breakers, 1875,” lat. $7^{\circ} 15' S.$, long. $61^{\circ} 26' E.$, a careful look-out was kept for broken water by H.M.S. *Fawn* in 1881, but none was observed, though there was a rough sea on; bottom was not obtained with 350 fathoms of line.

Chart 3, Chagos archipelago.

CHAGOS ARCHIPELAGO.—General Description.
—The extraordinary assemblage of islands and coral reefs included under the name of Chagos lies between the parallels $4^{\circ} 44' S.$ and $7^{\circ} 39' S.$, and between the meridians $70^{\circ} 50' E.$ and $72^{\circ} 44' E.$ Commencing from the northward, it comprises Speaker's bank, Blenheim reef, Peros Banhos islands, Salomon islands, Victory bank, Great Chagos bank (on which stand Nelsons island, Three Brothers, Eagle islands and Danger island), Egmont or Six islands, Pitt bank, Ganges bank, Centurions bank, Wight bank, and Diego Garcia island. Between the northern side of Speaker's bank and Addu atoll (the southern group of the Maldivé islands), there is a clear channel 240 miles wide. The whole group is British, and a dependency of Mauritius.

The most remarkable feature in this archipelago is the general atoll character of islands, reefs, and banks. It is an interesting fact that throughout the Laccadive, Maldivé, and Chagos groups there is no instance of either a fringing or a barrier reef; nothing but coral.

General charts 2899, 748b.

Chart 3, Chagos archipelago. Var. 4° W.

structure rises above the waves, and each group of islands and reefs is of the atoll formation.

It has been said that the deeper parts of the banks may be crossed when there is not much swell, but considering the uncertainty respecting the depths of partially examined areas, the changeable character of coral reefs, and the unexpected manner in which the sea sometimes breaks, it is best to avoid them, especially as communication with each of the islands may be effected without crossing a bank.

Current.—The set of the current among the Chagos group varies with the wind. From the middle of December until the middle of April the set is eastward, and from the beginning of June to the end of September westward, varying occasionally a little northward or southward of these directions.

During April and part of May, as also during the whole of November and December, both winds and currents are variable; the greatest rate of current observed, during the survey of 1837, was 2 knots an hour, over the Great Chagos bank.

During the surveying operations of H.M.S. *Sealark* from May to July, 1905, the current off the banks was found to be, practically, always running to the eastward and south-eastward, that is to say, against the monsoon, which blows here with considerable strength. This resulted in a deep, turbulent sea, which increased when in proximity to the eastern side of Great Chagos bank.

Tides.—Regular tides are experienced on the banks and near the islands of the archipelago; the flood stream sets E.S.E., and the ebb W.N.W.; high water, full and change, occurring about 1h. 30m. In some parts, the current and tidal stream run obliquely towards each other or are directly opposed, occasioning variations both in direction and rate; in strong breezes this causes a confused swell, which, on the shoaler parts of the banks, breaks in heavy rollers, the waves rising to heights of from 15 to 18 feet.

Speaker's bank (*Lat. 4° 55' S., Long. 72° 20' E.*).—This extensive and steep bank, the northernmost of the Chagos archipelago, is of irregular oval form, about 24 miles long N.N.E. and S.S.W., and 13 miles wide.

The edges of this bank are the shoalest parts, having, in general, depths of 6 and 7 fathoms over them. On the south-western edge there are only 4 fathoms, from which dangerous part the north-eastern islet of Peros Banhos bears S.W. by W. $\frac{1}{2}$ W. distant 19 miles, and the northern islet of the Salomon group, South, distant 12 miles. This part of the bank should be carefully avoided, as the sea breaks heavily on it during the S.E. monsoon.

General charts 2899, 748b.

Chart 3, Chagos archipelago. Var. 3° 50' W.

Within the edges, the water deepens to 15 and 22 fathoms, soft sand, with some coral heads of from 6 to 10 fathoms. Close outside the reef in all directions are ocean depths.

Blenheim reef.—The southern end of this reef lies 11 miles E. by N. from Ile de la Passe, on the north-eastern side of the Salomon group, and the north-western part is 9 miles south-eastward of the south-eastern end of Speaker's bank. The reef is 6 miles long N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. and 2 miles wide; a narrow strip, which is generally covered at high water, except some large blocks of coral and sand-stone on the eastern side, encloses a lagoon on all sides except at the southern end, where anchorage may be found, at the opening, in 6 or 7 fathoms. Within the lagoon, there are from 2 to 10 fathoms between the rocks; the outer side of the reef is everywhere steep-to.

Plan of Salomon islands on 4.

SALOMON ISLANDS (Lat. 5° 20' S., Long. 72° 16' E.).—Ile Boddam, the principal and westernmost of the group, lies 13 miles eastward of Peros Banhos islands, and, being covered with cocoanut trees about 70 feet high, is visible at a considerable distance in clear weather. The group consists of five large and six smaller islands, all standing on the atoll reef, which forms an irregular oval, 5 miles long and 3 miles wide, enclosing a lagoon, to which there is access through a pass on the north-western side. A shoal having only one fathom over it divides the pass into two channels; the eastern channel has a depth of 3 fathoms; the western channel, only 2 fathoms.

Within the lagoon are numerous coral rocks with deep water between them. The bar at the entrance is impassable during the N.W. monsoon.

The atoll belongs to a company in Mauritius, and there are living on Ile Boddam a white manager, his assistant, their families, and about 70 native labourers from Mauritius and elsewhere. The houses of the settlement are well built, and there is a small boat pier facing them.

Produce.—These islands are said to be more fertile than any others of the Chagos group, and were once thickly wooded, but the timber trees have now nearly all disappeared, their places being taken by cocoanut palms. Cocoanut oil is the principal product of the islands, about 11,000 gallons being made each year. A small quantity of turtle-shell is also exported.

Anchorage.—During the south-east monsoon anchorage may be found outside the entrance to the lagoon in 12 fathoms. Steer for the south extreme of Ile Takamaka, keeping it bearing S. 38° E., and

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Plan of Salomon islands on 4.

anchor when the south-east extreme of Ile de la Passe bears East. This anchorage was constantly used by H.M.S. *Sealark*. There is also excellent anchorage inside the lagoon in 12 fathoms off Ile Takamaka, with the north extreme of that island bearing N. 63° E. and the north extreme of Ile Fouquet S. 50° E. The small vessels visiting the atoll find anchorage off the settlement on Ile Boddam. No directions can be given for reaching these last anchorages, and navigation is best performed by conning from the masthead.

Tides and Tidal streams.—It is high water, full and change, at Ile Takamaka at 1h. 57m.; springs rise 4 feet 6 inches, neaps range 1 foot 5 inches. The tidal streams at the anchorage outside the lagoon entrance set from N.N.E. to East at the rate of about half a knot while the tide is rising by the shore, and from N.W. to West whilst it is falling, at the rate of from half a knot to 1½ knots. There is no period of slack water; each stream is at its greatest strength at the beginning of its course, gradually slackening. The stream on the bar runs with considerable strength, sometimes attaining a velocity of 2½ knots on the rising tide shortly after springs. The tidal streams are not felt at all at the anchorage off Ile Takamaka.

Supplies.—A few pigs and fowls are kept for the benefit of the inhabitants, but it is doubtful if there would be sufficient for supplying a vessel. No fruit or vegetables are procurable. Fish may sometimes be caught, but they are not plentiful.

Water is obtainable on all the islands of the atoll. The best is on Ile de la Passe and Ile Takamaka; the water rises and falls in the wells with the tide, but still remains sufficiently fresh to be drinkable.

Communication.—A sailing vessel visits the atoll three or four times a year from Mauritius, bringing supplies and taking away the cocoanut oil.

Plan of Peros Banhos on 4.

PEROS BANHOS (Lat. 5° 21' S., Long. 71° 58' E.).—This group of islets is the largest of the Chagos archipelago, and is next in importance to Diego Garcia. The atoll reef encloses a lagoon 120 square miles in area; on the ridge are 31 islands and islets of small extent. The height of the land forming these islands is in general only about 6 feet above high water, though sand dunes rise to 9 or 10 feet, and the greater part of Ile Coquillage is about 11 feet high. The seaward sides of the islands are, in general, formed of rock, mainly coral boulders, piled up by the sea, and the lagoonward sides are of sand, often running out at either end into bare spits. The land is subject to great alterations, being washed

Plan of Peros Banhos on 4. Var. 3° 50' W.

away in one monsoon and piled up in the other. The soil varies considerably, but, in general, there is a dark brown mould formed of decaying vegetable matter mixed with sand, and in some localities there are bare coral blocks on which cocoanut trees grow luxuriantly. All the islands except Coin du Mire, a small flat-topped rock with grassy patches, are now planted with cocoanut trees, and are generally fringed, on the seaward side, by cassava bushes. The cocoanut trees on Ile du Coin and Ile Diamant attain a height of over 100 feet; some are supposed to be as many years old. On the south-east corner of Ile du Coin is an immense mapou tree about 125 feet high, the top much wind torn, which bears on one of its northern buttresses the initials R.M., said to have been cut by order of Commander Richard Moresby, I.N., in 1837; it is not conspicuous from the lagoon.

The islands, as a whole, are visible from the deck of a vessel at a distance of about 15 miles. The group is a dependency of Mauritius, according to the laws of which it is governed; it is privately owned in that colony, and is administered by a manager and two white assistants, the former acting as magistrate, registrar, &c., and four natives acting as constables. This arrangement, or a very similar one, obtains in all the outlying cocoanut islands under the Mauritius or Seychelles Governments. The various establishments are visited periodically, for legal and inspectional purposes, by a magistrate.

The establishment at Peros Banhos, which was formerly divided between Ile Diamant and Ile du Coin, is now entirely situated at the latter island, the former having been given up since about 1845, owing to its inconvenience for loading vessels in the south-east monsoon. One or two caretakers are generally kept on Ile Vache Marine, Ile Poule, Ile Diamant, and Mapou de l'Ile du Coin, and there are also good houses, occasionally occupied, on several of the others; the establishment consists of manager's house, oil mills, oil stores, shop, and the coolie lines. The labour is obtained entirely from Mauritius, mainly of half negro and Tamil descent, while some are descendants of slaves imported at the end of the eighteenth century; the islands should shortly be self-supporting, so far as labour is concerned. The inhabitants are singularly free from sickness, there is little or no fever, and the permanent inhabitants usually live to a great age.

The population in 1905 consisted of the managers and their families, 13 in all, with labourers, numbering of men 85, women 51, boys 30, and girls 36, making a total of 215.

Produce.—The chief produce is cocoanut oil, expressed from the copra in rude mills worked by donkeys; about 2½ million nuts are husked annually, making upwards of 60,000 gallons of oil. A large

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Plan of Peros Banhos on 4. Var. 3° 50' W.

number of cocoanuts are also exported annually to Mauritius, also tortoise-shell to the value of Rs. 2,000 to Rs. 3,000.

The outer edge of Peros Banhos reef is entirely free from shoal spurs or connected dangers of any description, there being over 100 fathoms, and often more than 200 fathoms close alongside the reef. There is, however, one dangerous off-lying shoal, as now described.

Benares shoal (*Lat. 5° 15' S., Long. 71° 40' E.*).—This dangerous coral shoal, with general depths of from 4 to 7 fathoms, but with as little as $2\frac{1}{2}$ fathoms near its north-western end, lies W. $\frac{1}{2}$ S. distant $4\frac{1}{2}$ miles from the western extreme of Île Diamant; it is about $1\frac{1}{2}$ miles long N.W. and S.E., within the 10-fathoms line, and seldom breaks; there is deep water all round, and a depth of 600 fathoms between it and the reef of Peros Banhos.

Channels, depths, &c.—The main entrances to the lagoon are apparently deep and clear, but tide rips may be experienced in them; there is sometimes a slight disturbance on the bar between Île Vache Marine and Île Fouquet, due to the out-going tidal stream running against wind and swell; the bottom can be seen on the shoaler parts, but by steering a straight course with the houses of the settlement on Île du Coin ahead, bearing West, no further shoaling will be experienced until arriving at the anchorage.

The passage north and east of Île Vache Marine is not recommended, nor should a course be taken northward of that indicated above, on account of various dangers in that locality.

The other deep entrances to the lagoon are rarely used, as that described above leads most conveniently and directly to the settlement. Within the encircling reef and islands, the lagoon is studded with numerous coral heads, mostly situated in the south-west; the group lying about $1\frac{1}{2}$ miles north-west of Île Vache Marine is known as Danger shoals, and is partly awash at low water, but none of the others uncover, though some break in bad weather, while in fine weather they are easily seen from the masthead and avoided.

Anchorage.—The usual anchorage in the South-east monsoon is off the settlement of Île du Coin, in 12 fathoms, with the north extreme of that island bearing N. 82° W., and the east extreme S. 51° E.; this position is fairly well sheltered in the South-east monsoon, and is said to be so also in the North-west monsoon. The atoll being so open, and having so many large entrances, possesses no anchorage where a vessel may lie without rolling in the ceaseless swell, or escape being tide-ride.

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Plan of Peros Banhos on 4. Var. 3° 50' W.

H.M.S. *Sealark* anchored in eight different positions round the lagoon, in the South-east monsoon season, and found it impossible anywhere to escape both the swell and the tidal streams. The quietest anchorage is off Ile Fouquet, near the entrance leading to Ile du Coin.

During the season of North-west monsoon, December to May, the anchorage off Ile Diamant is to be preferred. From this anchorage, in from 14 to 17 fathoms, the huts of the island bear N.W., distant about 5 cables.

If approaching from the north-westward during the season of north-west winds, a vessel may enter either by the Passe de l'Ile Poule or by the Moresby channel, westward of the island group of that name.

Landing is difficult on all the islets, both on account of the swell, and because of the wide fringing reefs; in most cases it is not possible except near high water.

There is a boat channel, through the reef, abreast of the establishment on Ile du Coin; its entrance is marked, on the port hand, by a perch on the edge of the reef. It is not possible to reach the shore, except by wading, when the tide is below mean-water level. There is also a small boat channel, through the reef, leading to the beach on Ile Diamant, but it is only available while the tide is above mean level.

Tides.—It is high water, full and change, at Peros Banhos, at 1h. 30m.; springs rise from 5 to 6 feet.

Tidal streams.—At the anchorage off Ile du Coin the stream sets to the north-westward while the tide is rising, attaining a maximum velocity of about half a knot; it is scarcely felt during the falling tide. At the anchorage off Ile Fouquet the streams are barely appreciable with either tide. At the remaining entrances to the lagoon the tidal stream sets from N.N.W. to West, while the tide is falling by the shore, at a rate of from three-quarters to one knot, or more at springs; the other stream is less strong and sets from S. by E. to E. by S., at about half a knot, whilst the tide is rising. These observations were made during the South-east monsoon, and the result may be very different in other seasons.

Supplies.—The management is bound by law to keep supplies of rice, &c., for their labourers, for six months beyond the time of anticipated arrival of the vessel from Mauritius. A few pigs, turtle, and fowls are kept, but there is seldom more than sufficient for the needs of the establishment.

Fruit and vegetables.—Taro and papaya are found semi-wild, as well as bananas and pumpkins in some islands. The bread

Plan of Peros Banhos on 4. Var. 3° 50' W.

fruit, which has been introduced, is flourishing, and is being spread throughout the islands; various kinds of oranges and citrons have also been introduced, and are likewise being distributed. More than 20 different kinds of vegetable are grown in the gardens, but only the bringal, tomato, chili, cucumber, melon, lalo, and petoi appear likely to become common.

Fish abound in the lagoon, none being considered poisonous, while outside large shoals of bonito are found; porpoises visit the lagoon daily, and large whales are occasionally seen outside; sharks frequent the reefs, but large ones are scarce; the stingray is fairly abundant; the sea snake of Indian waters is not found, and the reef eels are not dangerous. Large reef cray fish abound, and are eaten, as well as crabs, clams, other shell fish, and octopus. About 120 green turtle are caught for food annually, and about 35 shell turtle, which are not edible; the latter species is most common in the North-west monsoon, laying its eggs in the day time, whilst the other visits the islands during the South-east monsoon, coming up on the beaches at night to lay.

Water.—There are wells in all the larger islands, and good though slightly brackish water may be obtained, but never in large quantities.

Communication.—A vessel from Mauritius visits the islands thrice yearly, bringing supplies and taking away the cocoanut oil.

Chart 3, Chagos archipelago.

Victory bank (Lat. 5° 32' S., Long. 72° 14' E.).—This egg-shaped coral bank is 4 miles in length, 2 miles in width, lies 10 miles southward of the Salomon islands, and nearly 9 miles north-westward of Nelsons island; the nearest part of the Great Chagos bank being 7½ miles distant from its southern edge. It rises steeply from deep water to within 3 fathoms of the surface, or perhaps less, round the outer edge, while there are from 14 to 20 fathoms inside.

GREAT CHAGOS BANK.—This extensive bank of soundings is of irregular oval shape, 95 miles long E.N.E. and W.S.W., by 65 miles wide. The south-eastern part bears about North distant 31 miles from the North extreme of Diego Garcia.

With the exception presently mentioned, the least water, from 4 to 10 fathoms, is found over a narrow coral belt round the edges of this bank, where it rises steeply from depths of more than 100 fathoms; within the edges, the soundings increase from 15 to 45 fathoms, where soft clay will be found, affording in some places good anchorage; there are, however, numerous isolated coral heads with from 6 to 10 fathoms over them; and in 1895 the schooner *Earnest* reported having actually

General charts 2899, 748b.

Chart 3, Chagos archipelago. Var. $4^{\circ} 10' W.$

sounded on a shoal with only 3 feet water in lat. $6^{\circ} 17' S.$, long. $72^{\circ} 12' E.$ This position can only be considered as approximately correct and the shoal has not as yet been reported by any other vessel.

On the northern part of Great Chagos bank is Nelsons island, and on the western edge are the Three Brothers, Eagle islands, and Danger island.

Caution.—Vessels should not cross Great Chagos bank when there is much swell on, and only in case of necessity; if obliged to cross it, the passage should be made, if possible, during the daytime, with a good look-out from the masthead, and the sun astern.

Nelsons island (Lat. $5^{\circ} 41' S.$, Long. $72^{\circ} 20' E.$).—This small rocky island on the northern edge of Great Chagos bank is $1\frac{1}{4}$ miles long and about 500 yards wide; it appears as the usual flat reef islet, it is 10 to 12 feet high, covered with low scrub, and has a few cocoanut palms upon it. There is a bay in the northern sandy beach, near the north-east point, at which a landing might be effected, but the island is uninhabited, and is only occasionally visited, for sea birds' eggs, by natives from the adjoining atolls. Large numbers of frigate birds are said to nest here.

Deep water is found close northward of Nelsons island, and a 25-fathoms channel, about one mile wide, just eastward of it, leads to an anchorage in 16 or 17 fathoms on the Chagos bank.

Three Brothers.—These are three small islands, covered with high cocoanut trees, lying 18 miles southward of the north-western angle of the Great Chagos bank, and from 10 to 13 miles eastward of Eagle islands, to which they belong; the people from the Eagle islands sometimes living on the Brothers. The surf renders landing difficult, but a reef protects the eastern side of the Middle Brother, behind which boats enter from the northward. The North Brother is separated from the Middle Brother by a deep clear channel $1\frac{1}{2}$ miles wide, having from 25 to 35 fathoms. A reef encircles the Middle Brother, between which and the South Brother is a deep channel nearly one mile wide, but with a rocky islet in the centre. The South Brother, $7\frac{1}{2}$ cables long, is the largest of the group; a reef with from 4 to 7 fathoms extends 5 miles E.S.E. from it.

Close south-westward of the Brothers group, a break in the edge of the main reef forms a channel $2\frac{1}{2}$ miles wide, with from 45 to 50 fathoms. On the southern side of this channel are some dangerously shoal spots.

Eagle islands (Lat. $6^{\circ} 11' S.$, Long. $71^{\circ} 20' E.$).—These two islands stand on the western edge of the Great Chagos bank, the southern island bearing about N.N.E. distant nearly 9 miles from Danger island.

Chart 3, Chagos archipelago. Var. $4^{\circ} 10' W$.

The northern island is $2\frac{1}{2}$ miles long by from half to three-quarters of a mile wide. It is nearly covered with high cocoanut trees, and at the south-western end are some high trees of another description, probably the *bois mapou*. From this point, a reef on which the sea breaks extends 5 cables south-westward. The southern island is smaller, low, and covered with bushes. Between the two islands there is a clear channel about $1\frac{1}{2}$ miles wide, where anchorage can be obtained in from 5 to 8 fathoms, sand and coral; care must be taken not to get off the bank of soundings, which is only a mile wide between the ocean depths outside the reef and depths of 17 or 18 fathoms inside the ridge on which the islands stand.

Supplies.—There is a village near the middle of the north-western side of the northern Eagle island, opposite which is the only safe landing place, and that a very difficult one during north-westerly winds. Wood, good water, and poultry can be obtained. Fish is abundant, and was formerly salted for export. Cocoanut oil is made on the island; also a little soap. Cotton, oil, and tortoise shell are exported.

Danger island.—This low island, covered with stunted trees, lies on the West extreme of the Great Chagos bank, and is about 15 miles N. by W. from the Egmont islands; it is $1\frac{1}{2}$ miles long and three-quarters of a mile wide. The sea breaks heavily round its shores, and a reef extends 3 miles southward from it, on parts of which the sea generally breaks.

Good anchorage in 17 fathoms may be found eastward of the island. It is reported that there is an abundance of wild poultry on the island belonging to the proprietor of the Eagle islands.

At 7 miles south-eastward of Danger island is a break in the reef, forming a deep channel 2 miles wide.

Plan of Egmont or Six islands on 4.

EGMONT or SIX ISLANDS (*Lat. $6^{\circ} 39' S.$, Long. $71^{\circ} 22' E.$*) are in the channel between Pitt bank and Great Chagos bank, being 5 miles distant from the latter. The islands stand on the southern and western sides of an oval atoll reef, $5\frac{1}{2}$ miles long and 2 miles wide, enclosing a lagoon closely studded with coral rocks with from 8 to 12 fathoms between them; the only entrance to the lagoon is a broad but shallow channel on the northern side, where the greatest depth over the edge of the reef is only 2 fathoms. There are no outlying dangers in any direction; the water is very deep all round close to the breakers.

On the south-eastern island there is a cocoanut oil factory, where a white resident manager and about 50 labourers live.

The whole of the group is planted with cocoanut trees, and is visible from a vessel's deck from a distance of about 14 miles.

General charts 2899, 748b.

Plan of Egmont or Six islands on 4. Var. $4^{\circ} 20'$ W.

The islands are very productive, but are over-run with rats; the gimpaille or cocoanut crab, exists in large numbers, but does little damage.

Anchorage.—Anchorage may be found just outside the bar of the entrance, in 6 fathoms, with the east extreme of Ile Lubine bearing S. 7° W., and the north extreme of Ile Sudest S. 45° E.; H.M.S. *Sealark* anchored here on two occasions during the South-east monsoon season.

Tidal streams.—At the above anchorage the tidal streams are but little felt; the set is to N.W. by N. with a maximum velocity of half a knot, during the falling tide; when the tide is rising the stream is not appreciable.

Supplies.—Pigs and poultry are kept in small numbers for the use of the establishment, and there is a fairly good supply of well water, but it is doubtful whether sufficient could be obtained for the replenishment of a vessel.

Communication.—A schooner, from Mauritius, visits the atoll about three times a year, bringing supplies and taking away the cocoanut oil. It is possible to navigate her in to the small pier that faces the settlement, but the lagoon is so full of coral heads, many of which break in ordinary weather, that it is unsafe to go about in it after dark, even in a small boat.

Chart 3, Chagos archipelago.

PITT BANK.—The northern extreme of this bank lies 20 miles south-westward of the great Chagos bank and 12 miles from Egmont islands, which divide the otherwise clear channel; from the north side of the bank, the trees on Egmont islands are visible from the poop of a vessel. The least water found is 4 fathoms, on the eastern side of the bank, which position lies W. by N. $\frac{1}{4}$ N. distant 53 miles from the north-western end of Diego Garcia. The bank lies N.N.W. and S.S.E., and is 30 miles long, by an extreme width, towards its southern end, of 18 miles. On all but the south-western and southern sides, depths of 6 or 7 fathoms were frequently found on and near the edge of the bank; on those sides it appears to be deeper, and the general depth over the bank within the edge is between 10 and 20 fathoms, in but few places exceeding the latter, with a bottom of soft sand or broken coral. The water is very deep close round the bank in all directions. Vessels are advised not to pass over it, especially at night.

Ganges bank (*Lat. $7^{\circ} 22'$ S., Long. $71^{\circ} 7'$ E.*).—This bank lies 13 miles south-westward from the nearest part of Pitt bank; it extends about 3 miles in each direction, the least known depths being from 8 to

General charts 2899, 748b.

Chart 3, Chagos archipelago. Var. $4^{\circ} 20' W.$

12 fathoms, but there may be less. At one cable outside the bank in any direction it is difficult to find bottom.

Centurions bank, the south-westernmost shoal of the Chagos archipelago, lies 17 miles south-westward from the Ganges bank; it is about 5 miles in length N.W. and S.E., and $1\frac{1}{2}$ miles wide; the general depths over it are from 6 to 14 fathoms, but heavy rollers have been observed to break on its north-eastern edge. The water is very deep, close to on all sides.

The tidal streams on this bank have been observed setting West and N.W., with a falling tide, at the rate of about a quarter of a knot.

Between Pitt, Ganges, and Centurions banks there are clear navigable channels, the northern 12 miles, and the southern 16 miles wide.

Wight bank.—The Commander of the British steam vessel *Delhi* in 1886 reported the existence of this bank, lying about 10 miles S.S.E. from Pitt bank, and about 52 miles westward of Diego Garcia. The least water obtained was $4\frac{3}{4}$ fathoms.

As it is probable that less water than that now given may exist, mariners should navigate in the vicinity with caution. Its approximate position is lat. $7^{\circ} 25' S.$, long. $71^{\circ} 28' E.$

Midway between Wight bank and the southern, charted, position of Pitt bank is another bank, with depths of 7 and 8 fathoms over it.

H.M.S. *Sealark* anchored on this bank in July, 1905, in 8 fathoms, her position, well established, being latitude $7^{\circ} 20' 2' S.$, longitude $71^{\circ} 28' E.$; the weather was remarkably fine, but sudden swells were rising and crossing the bank in all directions, no breakers were observed, but probably there would be many in heavy weather. No current was experienced during the four hours she was on the bank, a period during which the tide was rising at Diego Garcia.

Plan 920, Diego Garcia.

DIEGO GARCIA (Lat. $7^{\circ} 20' S.$, Long. $72^{\circ} 25' E.$).—**General description.**—This island is the southernmost of the Chagos archipelago. It is an atoll of irregular shape, being 13 miles in length North and South, and over 6 miles in width at the northern and widest part. The strip of land which nearly encloses a vast lagoon is on an average about one-third of a mile wide; at the north-western end only, near Simpson point, it is nearly $1\frac{1}{4}$ miles wide, while at the north-eastern side it is generally very narrow; in 1885, about half a mile north-westward of Cust point, it was only 38 yards wide, and at $2\frac{1}{2}$ miles farther north-westward it was 58 yards across. A steep-sided coral reef borders the whole of the outer side, and forms a breakwater except at the northern end where are the entrances. The land is subject to alteration, being at times washed away at one part and raised at another. The general height.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. 4° 20' W.

of the strip of ground above high water is only from 3 to 5 feet; at Barton point are two sand mounds from 8 to 18 feet high, but not visible to seaward, being surrounded by trees. The outer part of the island is the highest in consequence of the pile of coral boulders thrown up by the sea. The base of the island, so far as it has been examined, is of coral rock. The nature of the soil varies considerably; in some localities there is nothing but bare rock, on which coral boulders are scattered; in other places there are from 6 to 8 feet of calcarious sand above the rock, while on the higher and older parts a peaty mould several inches deep has been formed.

There are marshy pools of fresh or brackish water on the south-eastern and western sides of the strip of ground which encloses the lagoon; into some of these, salt water enters at the highest spring tides, especially at the southern and south-eastern parts, where the sea has established some permanent breaches.

Trees, &c.—From a short distance the whole island appears to be covered with vegetation, principally of bright green colour, bordered by a beach of white sand. The principal trees are the cocoanut, of which there are said to be over a million, and in some places they attain a height of 110 feet. They were on the island when discovered, and are reproduced naturally by the falling nuts; latterly a few hundreds have been planted. Several clumps of casuarinas grow on both sides of the island; their thread-like graceful tops wave above the mass of cocoanut trees. The *bois mapou* is not uncommon, and grows to a considerable size, though never gigantic. There is a single clump of large trees *Afzelia bijuga*, on the north-western side of the island, 112 feet high; they do not now propagate, as rats eat the seed. The *bois de fen* and *bois malgache* are used for building small boats. The *bois blanc* is a common tree; the inhabitants use an infusion of the flower as a medicine. The cassava grows thickly, in some places presenting impenetrable masses of low bush. There are a few specimens of wild cotton; also a few grasses, which form a tolerably thick turf in some parts, and supply food for the donkeys which have been imported to turn the oil mills.

Fruits and Vegetables.—In the gardens of each estate, bananas, custard apples, bitter oranges, and a few other tropical fruits are grown. Attempts to introduce potatoes and green vegetables have failed owing to the swarms of land-crabs, which destroy the roots and tubers.

Animals, Birds, and Insects.—Cattle do not thrive, but a few pigs are reared. Sheep and goats are said to have been destroyed by the donkeys. The Mauritian gecko (a large lizard) is common.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. 4° 20' W.

Rats are numerous and very destructive. There are three species of land-crab, which swarm all over the island; also remarkable hermit and soldier-crabs, which are nocturnal in their habits, and climb the trees for the sake of shelter and protection. Common flies, huge cockroaches, mosquitoes, and ants are a perfect pest.

Two species of terns lay their eggs in September in countless numbers. Frigate-birds and boobies are abundant. There are two species of heron, a small kind of plover, sand-pipers, and African wading birds.

Fish are scarce inside the lagoon. The negroes eat without any special preparation some descriptions of fish which are considered poisonous at Mauritius and the Keeling islands. There are several sorts of eels, but they are not eaten. Immense rock-lobsters are caught on the outer shores, and are excellent eating. The lagoon is infested by sharks, so that it is dangerous to bathe in deep water. A few large hammer-headed sharks frequent particular parts of the lagoon; the blue shark, about 9 or 10 feet in length, is the most common within the lagoon; outside they are much larger. Green turtle visit the island chiefly during the South-east monsoon, and the hawksbill is fairly common during the North-west monsoon; the flesh of the latter is poisonous, but the back of one will yield from 3lbs. to 5lbs. of valuable tortoise-shell; three or four are captured weekly during the season. A small tortoise is found in some of the marshy pools:

Population and Laws.—Diego Garcia is a dependency of Mauritius; the manager and sub-manager of the oil works, the only two Europeans on the island, are from Mauritius. The manager resides at East point, and is the magistrate of the island. The sub-manager resides at Marianne point. A magistrate from Mauritius visits the island once a year, but all important cases have to be tried at Mauritius. The sale of spirits is prohibited, and only a small ration of red wine is allowed to each man.

With the exception of about 4 acres of land at Mini Mini, which belongs to the Mauritius Government, the island is leased by the Mauritius firm, Société Huiliere de Diego et Peros. The manager, with four white assistants and their families, number 10 persons of European descent, all from Mauritius. The establishments are at Marianne point, and at East point, where there are substantial residences, oil mills, and storehouses, with labourers' huts, built of wood and thatched with palm leaves.

The labourers are principally negroes from Mauritius, with a few Africans and Hindus engaged for a term of years; there are also a

General charts 2899, 7486.

Plan 920, Diego Garcia. Var. 4° 20' W.

few "*enfants des îles*" born on the island, and these are, as a rule, both physically and morally superior to the others. The labourers are paid by task-work, amounting to about Rs. 8 a month, with food. In 1905 the population amounted to 520, of whom 313 were resident at East point. The language spoken generally is a French-creole *patois*. The religion is nominally Roman Catholic; but there is no resident priest nor any attempt at education.

Time.—Standard time, in Diego Garcia and throughout the Chagos archipelago, is the mean solar time of longitude 75° E. of Greenwich or 5 hours fast of Greenwich mean time.

Winds, Weather, and Climate.—From April to September the South-east trade wind, here known as the South-east monsoon, blows steadily; during the other six months the island comes under the influence of the North-west monsoon, with frequent calms and heavy rains. It has sometimes been noticed, but the rule is not invariable that when the North-west monsoon is strong, the South-east monsoon following it will be light until approaching the close of that season; the converse is also the case. The period of the South-east monsoon is considered the dry season, and the first three months of the year generally witness the greatest rainfall. The wet season is usually during the North-west monsoon, but in 1885 and on several occasions since it was reversed, and the South-east wind brought torrents of rain every day. Generally speaking, there is scarcely a day throughout the year without a shower, but droughts of a month's duration have been known. Calms prevail in March and April, with but little rain. The total annual rainfall, 1907-1908, was 108 inches.

The only cyclone known to have passed over this neighbourhood occurred in January, 1891. It commenced suddenly with a heavy squall from south-west, the wind gradually veering through west to north, and lasting three days, doing a great amount of damage to the cocoanut trees; the barometer fell to 29·30.

There have been three earthquake shocks during the last 20 years; the latest and also the most severe occurred at 3 p.m. on May 7th, 1901. In October, 1901, abnormally high tides occurred, flooding the island in places.

From May to November is the cool season, with the South-east wind blowing. The temperature throughout the year ranges between a day temperature of 86° and a night temperature of 74°, rarely passing those limits. See Meteorological table, Appendix I., page 519.

The island is healthy; dysentery, pneumonia, and liver complaints are the only diseases among adults, but the mortality among native children is very great; quite 50 per cent. die shortly after birth, the principal cause being tetanus; there is no malarial or other fever.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. 4° 20' W.

One epidemic of beri-beri has been known; it was imported from Mauritius, and lasted from January to June, 1901, causing several deaths among the natives.

Coal.—About the year 1881, two coaling stations were established at this island, one by the Orient Steam Navigation Company, the other by Mr. Lund; both were provided with all necessary appliances, lighters, &c., and at East point a wooden jetty was erected, alongside of which vessels of 24 feet draught could lie afloat and coal. At times there were from 3,000 to 4,000 tons of coal in store, and for several years the large vessels of the Orient line as well as several men-of-war coaled here, thus proving its capabilities as a coaling station. Nevertheless, from economic reasons, it has been abandoned as such; no coal has been in stock for some years, and the whole arrangement of stores, piers, lighters, wharfs, &c., has been dismantled and destroyed.

Supplies, Communications, &c.—A few fowls and ducks may be purchased, also bread, vegetables, and fruit in small quantities; fish are scarce inside the lagoon, but fishermen go outside when the weather permits.

Brackish water may be found by digging wells in the sand, but the inhabitants store rain water in tanks for drinking purposes. The only regular communication with the outer world is through Mauritius, four times annually, by means of the oil company's sailing vessels.

Produce and exports.—The trade with Mauritius consists of cocoanut oil, nuts, and tortoise-shell; 200,000 gallons of oil are exported annually.

Great damage is done to the cocoanut industry by rats, which, it is estimated, destroy one-third of the nuts; they live in the trees.

Approach.—Though the land is so low, the dense covering of trees over 100 feet high is visible from the deck of a sloop, in clear weather, at 12 or 14 miles; and there being no outlying dangers the coast may be followed round at any convenient distance. The two entrance points to the lagoon are Barton point on the eastern, and Eclipse point on the western side. Barton point is low, covered with short scrub, and has a cluster of dwarf palms just inside the point, not easily seen until fairly close. Eclipse point, $3\frac{1}{2}$ miles W.S.W. from Barton point, is thickly covered with palms to the water's edge, and is easily recognised. The three islands at the northern end, East, Middle, and West islands, which divide the entrance into three passes, may be clearly distinguished about 5 miles distant, and can be approached on their outer sides within 2 cables.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. $4^{\circ} 20'$ W.

The lagoon is 12 miles long, and $4\frac{1}{2}$ miles wide at the northern part, decreasing irregularly towards the southern end, where it becomes narrow and shallow; it has no communication with the sea except at the northern end between Barton and Eclipse points. Within the lagoon, 5 miles S.S.E. $\frac{1}{4}$ E. from the centre of the Main pass, is Marianne point, which is very conspicuous in approaching from the northward, with its white beach, dark trees, and houses, and constitutes a good mark to run in on.

East island is about 900 yards long, and has a mean width of 200 yards; the western side consists of sand piled up on the reef rock, and on it is a clump of trees (*Hermandia peltata*), 60 feet high. The even surface of the other part is about 4 feet above high water, and is covered by low scrub, without palms or other trees.

The reef on the South, West, and North-west sides uncovers at low water springs, about 50 yards from the islet; on the N.W. reef there is a sloping heap of boulders thrown up by the waves. From the eastern end of the islet, the reef extends more than 2 cables, but has 2 fathoms close to the shore, where the strong stream causes considerable erosion.

Middle island (Lat. $7^{\circ} 14'$ S., Long. $72^{\circ} 25'$ E.) is not half the size of East island, but has on it trees about 50 feet high; a reef, three-fourths of which uncovers at half-tide, extends S.W. by W. about 8 cables from it; a continuation of the same reef stretches a similar distance southward and south-eastward.

West island is about 300 yards long and very narrow; it has a conspicuous cluster of palms on its south-western point, and is joined to Eclipse point by a reef which uncovers, and through which there is not even a boat passage. The north-eastern end may be safely passed within 2 cables, in 5 fathoms water.

Conspicuous objects.—Besides the points of recognition already described, it may be useful to note that about $2\frac{1}{2}$ miles south-eastward from the high clump of trees opposite Eclipse bay, there are two clumps close together between two gaps in the forest trees; being distinguishable from the northward, their bearing may be useful. At Widow point, $1\frac{1}{2}$ miles southward of Marianne point, and nearly opposite East point, is another double clump of trees, 110 feet high. About $2\frac{1}{4}$ miles north-eastward of East point, near the ruined settlement of Minni-Minni, is a single conspicuous tree, 100 feet high. East point may be known by the trend of the land and the houses. About 3 miles southward of East point are several more conspicuous clumps of high trees.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. $4^{\circ} 20'$ W.

ENTRANCES.—Barton pass, nearly 8 cables wide, is greatly obstructed by reefs, and is only available for small craft when navigated with knowledge and caution, when a least depth of $3\frac{1}{4}$ fathoms may be carried through to the deep water of the lagoon, avoiding a 16-foot mid-channel patch at the inner end of the pass. A reef extends 3 cables from Barton point in a north-westerly direction and shoal water 2 cables farther before reaching 3 or $3\frac{1}{2}$ fathoms, which depths continue about one cable before commencing to shoal again at 2 cables from East island. There are a number of shoal patches scattered about the northern end of the lagoon within 2 miles of East island, having from $1\frac{1}{2}$ to $3\frac{1}{2}$ fathoms over them, as may be seen on the chart.

Middle pass is $3\frac{1}{2}$ cables wide between East and Middle islands, and $1\frac{1}{4}$ cables between the reefs, with 19 fathoms water in the centre, but it is almost barred at its inner end and becomes so shallow and intricate that it would require an elaborate arrangement of buoys to render it navigable by vessels drawing 18 feet.

Main pass (*Lat. $7^{\circ} 13'$ S., Long. $72^{\circ} 24'$ E.*).—This, the western of the three entrances, is by far the best and the only safe channel, having from 5 to 6 fathoms over a clear width of $3\frac{1}{2}$ cables. Vessels of the deepest draught may proceed from this channel to all the principal anchorages within the lagoon by careful navigation between the reefs.

Shoals.—As already stated, there are no external or outlying dangers; the outer sides of the atoll sloping away rapidly to depths of 100 fathoms and upwards at a few hundred yards from the edge of the flat reef, which in most places extends 60 yards from the shore, and is just uncovered at low water springs. The sea always breaks heavily on the reef, rendering it impossible to land anywhere outside the lagoon. The inner shore, generally, slopes gently into the lagoon for some distance, and then drops suddenly to a depth of 10 or 12 fathoms; but in some places there are from 6 to 8 fathoms close to the inner shore. The available space within the lagoon is much curtailed by shoals at the northern and southern ends, and at places the depth varies within a few yards from 16 fathoms to a few feet.

Spur reef extends nearly one mile in a S.S.W. direction from Middle island. The western side, on which the sea always breaks, dries 3 feet at low water; the eastern side was, and probably still is, marked by a wreck. Foul ground extends one mile southward and $1\frac{1}{2}$ miles south-eastward from the reef.

Parry patch, of $2\frac{1}{4}$ fathoms, at the entrance to Rambler bay, lies nearly $2\frac{1}{2}$ miles N.E. by N. from Marianne point. Elder rock, of 5 feet, lies $2\frac{1}{10}$ miles E.N.E. from Marianne point. A 4-fathoms coral patch lies 7 cables S.W. $\frac{1}{4}$ S. from Elder rock, and N.E. $\frac{1}{3}$ E.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. $4^{\circ} 20'$ W.

distant $1\frac{1}{2}$ miles from the conspicuous clump of trees on Marianne point. At 4 cables W. by N. $\frac{1}{2}$ N. from this patch is another with only 3 fathoms. Many other patches exist in the open part of the lagoon northward of those last mentioned, but all have a greater depth over them than 5 fathoms.

Minni-Minni patch, with 17 feet, is about half a cable in extent, and lies $6\frac{1}{2}$ cables N.W. from the ruined settlement at Minni-Minni. A 3-fathoms rock lies $1\frac{1}{2}$ miles W. by N. from Minni-Minni, and $1\frac{1}{10}$ miles E. by N. $\frac{1}{4}$ N. from Marianne point; between it and East point, as also everywhere southward of this, the lagoon is more or less closely studded with dangers, making navigation for a large vessel difficult, but quite possible up to 3 miles from the southern end, with the aid of a careful look-out from aloft, and by buoying the intricate parts.

Buoys.—The only buoys are some small warping ones off the pier-head at East point (*Lat. $7^{\circ} 23'$ S., Long. $72^{\circ} 28'$ E.*).

Directions.—The outer shores being free from off-lying dangers a vessel may run for the island, if the weather be not so thick as to prevent land being seen from a distance of 2 or 3 miles; but, being low and sometimes enveloped by mist at night, great caution is requisite in running for it at such times; nor should it be approached at all during a dark night. If running for it in a clear night, or in the day with thick weather, a vessel should be kept under such easy sail as she could bear on a wind, so that on sighting the island her head may be laid off-shore immediately if necessary.

During the South-east monsoon, sailing vessels should approach from the eastward, and so time their arrival as to reach the western or Main pass during the flood tide, as it is impossible to beat in against the ebb. A good look-out should be kept from the masthead, and the sun should be astern or nearly so; the bottom inside the lagoon can sometimes be seen in 10 fathoms water.

Large vessels under steam or with a fair wind should pass from 2 to 5 cables eastward of West island, steering S.S.E. $\frac{1}{4}$ E. direct for Marianne point, which course leads over nothing less than 5 fathoms; when half a mile within the passage on that course, a curve to the westward will avoid the 5-fathom patches if necessary, and if bound to Eclipse bay steer about South for the anchorage. If going farther in, bring the centre of West island to bear N.W. $\frac{1}{4}$ N. when it is 7 or 8 cables distant, and run S.E. $\frac{1}{2}$ S. until the centre of Middle island bears N. $\frac{1}{2}$ E., and the high clump of trees in Eclipse bay W. $\frac{3}{4}$ S. southerly; keep the clump on that bearing, steering the opposite course and making due allowance for tide, until Observatory point bears

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. $4^{\circ} 20' W.$

N. $\frac{1}{2}$ W., when it may be approached on that bearing and anchorage taken up near it, or anywhere as most convenient in Orient bay.

If bound to Minni-Minni or to East point; from the position when Middle island bears N. $\frac{1}{2}$ E., and the clump of trees in Eclipse bay W. $\frac{3}{4}$ S. southerly, the course will be S.E. $\frac{1}{2}$ E. for 2 miles and then S.E. by E. $\frac{1}{2}$ E. for the conspicuous tree at Minni-Minni; this leads direct to the anchorage off Minni-Minni, leaving the Elder rock and Minni-Minni patch on the port hand, and the 4-fathoms patch off Marianne point on the starboard hand. If going on to East point, it is necessary to buoy the channel carefully before proceeding farther.

ANCHORAGES.—As the general depth throughout the broad part of the lagoon, except the 2 miles at the northern end, is between 12 and 16 fathoms, anchorage may be taken up in any part, simply avoiding the shoal patches and places marked on the chart as rocky. During the North-west monsoon, from the beginning or middle of December to the beginning or end of April, a vessel should anchor on the western side of the lagoon, under the lee of the land.

Eclipse bay is the nearest and most accessible anchorage, affording the smoothest water during the North-west monsoon, being protected by Eclipse point and the reef which joins West island; but it is a 4-miles pull from the habitations on Marianne point, and during the South-east monsoon there is a fetch of 6 miles across the lagoon. A good berth for a large vessel is about a mile from the shore in 12 fathoms, fine sand and broken coral, with the centre of West island bearing N. by W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles, and the high clump of trees W. by S. $\frac{1}{4}$ S. Small vessels may anchor closer to the shore in about 8 fathoms, guided by the chart and being careful to avoid shallow coral patches.

Orient bay (*Lat. $7^{\circ} 16' S.$, Long. $72^{\circ} 27' E.$*) has a great extent of anchorage ground in from 9 to 12 fathoms; at 2 or 3 cables S. by E. from Observatory point is a good berth in from 8 to 10 fathoms, sand; or at 5 to 10 cables S.S.E. $\frac{1}{4}$ E. from the same point in 11 or 12 fathoms, broken coral and sand; the latter anchorage is about 5 cables from the nearest shore, 3 cables from the reef, and $4\frac{1}{2}$ miles from Minni-Minni—a smooth water passage during the South-east monsoon. This is a good general anchorage, and landing is at all times practicable on Observatory point.

Rambler bay.—The whole of this large bay affords safe anchorage in about 14 fathoms, broken coral, at a mile or less off-shore, there being no danger at 5 cables from the shore except the Minni-Minni patch, already described. A convenient berth is in about 13 fathoms, soft broken coral, with Minni-Minni high tree bearing E.S.E., distant 7 cables, and East point house about S. by W. $\frac{1}{2}$ W.

General charts 2899, 748b.

Plan 920, Diego Garcia. Var. $4^{\circ} 20'$ W.

This is the best anchorage during the South-east monsoon; the water being then smooth, and boats can land easily at all times. During the North-west monsoon, a vessel should keep farther off-shore or go to the other side of the lagoon, as a swell and short chopping sea set in.

Marianne point.—A vessel desiring to be near that settlement may anchor in 9 or 10 fathoms, broken coral, with the principal house bearing about West one mile, but care is required in taking up this berth in consequence of the shallow tongue extending E.N.E. from Marianne point and of the many shoal patches in this vicinity as before described. The white coral sand appears to make good holding-ground.

East point anchorage (*Lat. $7^{\circ} 23'$ S., Long. $72^{\circ} 27'$ E.*) is excellent at all seasons, but the 2-miles passage from Rambler bay, being studded with shoals, is only practicable when buoyed. As there is a depth of 6 fathoms at half a cable S.S.W. of the point, vessels can anchor at any distance between the point and the rock which lies 6 cables W. by S. $\frac{3}{4}$ S. from it, or between that bearing and South, avoiding a similar rock bearing S.W. distant $4\frac{1}{2}$ cables from the point. The depth at that part is from 7 to 9 fathoms, coral and sand.

Tides.—It is high water, full and change, at Observatory point, at 1h. 38m. Springs rise 5 feet 8 inches; neaps, 3 feet 8 inches; neap range 1 foot 10 inches. At springs, the ebb stream sets N.N.W. at more than 2 knots out of the lagoon, and at a greater rate over the bar at the mouth. From the entrance, the flood sets up the lagoon about S.S.E.

General charts 2899, 748b.

CHAPTER III.

TROMELIN ISLAND.—ISLAND OF MAURITIUS.—CARGADOS CARAJOS
SHOALS.—RODRIGUEZ ISLAND.

(Lat. $13^{\circ} 30' S.$ to Lat. $20^{\circ} 40' S.$)
(Long. $54^{\circ} 20' E.$ to Long. $63^{\circ} 30' E.$)

VARIATION IN 1911.—Decreasing about 3' to 4' annually.

Plan of Tromelin island on 1881. Var. $6^{\circ} 30' W.$

TROMELIN ISLAND (Ile de Sable) (Lat. $15^{\circ} 52' S.$, Long. $54^{\circ} 25' E.$).—This solitary spot is about 240 miles eastward of Madagascar and nearly 300 miles N.N.W. from Mauritius. In 1761, the French transport *Utile* was wrecked on this island and 80 blacks, men and women, were left on it; all died but seven women, who maintained themselves for no less than 15 years, mainly on shell-fish and brackish water; they were discovered and taken off by a Captain Tromelin, after whom the island is named. Tromelin consists of a mass of sand nearly a mile in length N.W. and S.E., and about 800 yards wide. The northern part is 15 feet high and covered with bushes, the southern part is very low. The whole island is surrounded by a fringing coral ledge 150 yards wide, on which the sea breaks heavily. There is a small galvanised iron hut on the north-east end of the island.

Anchorage.—A bank of soundings over which there are 10 fathoms or less, extends half a mile south-eastward and eastward, also one mile north-westward with depths of from 7 to 10 fathoms. On the latter, there is anchorage in 8 fathoms, sand and coral, under the lee of the island during the South-east monsoon, but the holding ground is indifferent.

Landing can only be effected on a steep sandy beach just eastward of the North extreme, and even there it should only be attempted near high water.

Tide race.—A heavy race is caused off the North extreme of Tromelin island by the meeting of the ebb stream and the west-going current; this often breaks so heavily as to be dangerous for boats at 2 or 3 cables from the shore.

General charts 2899, 748a, b.

Chart 711, Mauritius, or the Isle of France.

MAURITIUS.—General description.—Mauritius is the principal British possession in the Southern Indian ocean and the chief seat of government. To it are attached as dependencies the island of Rodriguez; Agalega islands; Tromelin island; Coetivy island; Farquhar islands; Cargados Carajos group of islets and shoals (St. Brandon); and the Chagos archipelago including Diego Garcia. Representatives of the Government are stationed at Rodriguez and at Diego Garcia.

History.—Mauritius was discovered and named Cerné by the Portuguese pilot Diego Fernandez Pereira, on the 7th February, 1507. There were no inhabitants, nor traces of any, but the Portuguese retained a nominal possession until 1598, when a Dutch squadron took formal possession and called it Mauritius, in honour of Prince Maurice of Nassau, still leaving it uninhabited until 1638, when they made three settlements, and built a fort at Grand port to assist in the suppression of piracy. The Dutch, finding it unprofitable and troublesome, abandoned it in 1710.

In 1715 the French took possession, and changed the name to Ile de France; four years later it was ceded to the French East India Company, who, in 1734, sent out the celebrated Mahé de la Bourdonnais, a man of eminent talent; he introduced the cultivation of the sugar-cane and cassava, the manufacture of cotton and indigo, made roads, and established a capital at Port Louis. In 1764, the island reverted to the Crown of France, and received its first charter as a Crown Colony in 1766. It became a self-governing colony in 1790, but reverted to the Crown once more in 1802, and in 1810, during the general European war, it became a base for privateering operations, inflicting great damage on British trade. This resulted in an expedition for its capture, which proved successful, and the island surrendered on 10th December, 1810. The ancient name, Mauritius, was restored and British sovereignty confirmed by the treaty of Paris in 1814, the inhabitants being allowed as far as possible to retain their laws, religion, and institutions.

Port Louis still remains the capital of the island, which is a Crown colony, but the Government is more representative than is generally understood by that term. The existing laws are based on the *Code Napoleon*, with such modifications as have been found necessary, and are administered by a Governor, who has the power of sending aliens off the island without assigning any reason; an executive council of seven members, five official and two elected; and a legislative council of 27 members, of whom eight are *ex-officio*, nine are nominated by the Governor, and 10 by the nine districts, of which that of St. Louis returns two; the others one each.

General charts 2899, 748a.

Chart 711, Mauritius, or the Isle of France.

The nine districts into which the island is divided are: Port Louis, Pamplemousses, Rivière du Rempart, Flacq, Grand port, Savane, Moka, Plaine Wilhems, and Black river. The only elective municipality in the island is that of Port Louis. Government support is given equally to the Roman Catholic and Anglican churches, but of the Christian inhabitants by far the larger portion are Roman Catholics.

Population.—On January 1st, 1908, of an estimated population of 383,408, 263,983 were Indians, 143,930 males and 120,053 females; most of these latter were coolies or the descendants of coolies imported to work the sugar estates; these people are very industrious, and are slowly but surely acquiring a large amount of property, both in town and country; the value of which registered between 1864 and 1900 amounted to no less a sum than Rs. 2,42,98,000, and in 1908 they had also Rs. 27,54,763 in the saving banks. The remainder of the population are mainly of French or of mixed descent, and are chiefly French in habits and customs. English is the language used in the courts of law, French for trade and general purposes by the educated classes, and a creole *patois*, based on French, is spoken by the lower orders.

In 1767, the total population was only 19,000. In 1871 the number was 316,042, in 1881 it was 359,850, and in 1901, 371,023; thus showing a gradual progression, the births exceeding in number the deaths, and immigration still being in progress, especially amongst the Asiatics. In 1834, coolies were first imported from India; as shown above, they now form a large and important majority. Port Louis contains about one-sixth of the entire population. The proportion of males to females in the entire population is about 1,133 to 1,000; but amongst the Indians it is 1,200 to 1,000. The Royal college and all schools are either entirely or partially supported by the State; of the pupils, about 65 per cent. are Roman Catholic, 3 per cent. Anglicans, 23 per cent. Hindus, and 9 per cent. Mohammedan. The continuance of the plague greatly interferes with education.

General Aspect, &c.—Mauritius is of volcanic formation and of considerable height; its geographical position renders it most valuable in affording a convenient resort for repairs and supplies, especially of coal, to vessels engaged in the Indian and China trade; also, with the Eastern archipelago and Australia. It lies 470 miles eastward of the coast of Madagascar, Tamatave being the nearest port; is 34 miles long N.N.W. and S.S.E. by 22 miles wide, with an area of 705 square miles. Its shores rise somewhat steeply from the sea, a depth of 100 fathoms, or upwards, being found at from one to 1½ miles off-shore in most parts; but, off the north-eastern end, the

General charts 2899, 748a.

Chart 711, Mauritius.

base of the island is prolonged by a bank of soundings some 15 miles in extent, on which are several small islands and shoals, as presently described.

The western and central parts are mountainous, attaining a height of 2,711 feet in the Piton Rivière Noire, the highest summit; this peak is pointed, appears dark in clear weather, and is then visible from a distance of 50 miles; but, as the summits are frequently enveloped in clouds, the land is not generally seen from so far. Pieter Both, or Pieterboth as it was originally named after a Dutch Admiral drowned on this coast in 1616, is a remarkable mountain, 2,676 feet high, having a huge knob on the summit; it is only 3 miles south-eastward from Port Louis citadel. Piton du Milieu, near the centre of the island, is a steep-sided cone, 1,932 feet high. Corps de Garde presents a straight perpendicular shoulder, and Mount Rempart shows three needle-pointed peaks; all are good landmarks, the upper parts being generally bare basaltic columns; and amongst them are many extinct craters and caves of great extent. The whole island is picturesque, the scenery varied and beautiful.

Mauritius is surrounded by numerous coral reefs; it has many small streams, generally flowing through deep ravines, but none are navigable beyond a short distance from the sea. In the dry season, they are little more than brooks, but become raging torrents during heavy rains. The principal stream, the Grande Rivière, has only a course of about 10 miles. A very deep lake, the Grand Bassin, near the southern end of the island, is doubtless an extinct crater; and there are other lakes of that description. Though there are several ports and anchorages of minor importance, the two principal harbours are Port Louis, on the north-western side, and Grand port, on the opposite side; they are directly connected by railway.

Products.—The soil is generally red clay, and very stony, but some parts are flat and fertile; being well watered, it produces most of the tropical trees and herbs; a species of *pandanus* is largely grown, the leaves being made into sugar-bags. The fruits include the tamarind, mango, banana, guava, shaddock, fig, avocado-pear, litchi, custard-apple, and mabolo. The pine-apple grows to perfection without cultivation; but the chief productions are sugar and rum.

Mauritius originally contained large forests with valuable trees; the wood from these trees was very durable, and in many cases exceedingly beautiful; but the need for land for sugar cultivation and the need for firewood has caused a disastrous shrinkage of the old indigenous forests. The necessity of a policy of reafforestation has been recognised, and a Forest Department is now doing good work; there were, in 1908, 84,529 acres of ground under care of this department.

General charts 2899, 748a.

Chart 711, Mauritius.

Experiments are being made with rubber plants, but definite judgment could not be given; cocoa plants and the Ylang-Ylang scent tree are also being experimented with.

Trade, &c.—Of the colony generally it may be stated that it imports nearly everything required for its own use, and exports almost its whole produce. In 1909 the principal articles imported were: Corn, grain, and meal; manures and fertilisers; bullion and specie; coal; provisions and preserves; miscellaneous articles; hardware and cutlery; oil; cotton manufactures; the whole of the imports amounting to Rs. 2,93,13,790. In the same year the principal articles of export were sugar, rum, molasses, cocoanut oil, and fibre-aloe; and the value of the whole exports, Rs. 3,28,02,140. The value of the imports, though below that of the previous years, is about the mean of the previous five years, but the value of the exports was the lowest for eight years. The long continuance of bubonic plague in Mauritius, with the consequent quarantine established against it by its neighbours, tends greatly to check the operations of trade.

The total number of vessels that entered and cleared from the ports of Mauritius in 1908, exclusive of the coasting trade, was 410, of a tonnage of 769,049, of which British vessels supplied 67 per cent.

COMMUNICATIONS (*See also* pages 24, 25.). — **Submarine cable.**—Mauritius is in direct telegraphic communication with the general system of the world by means of the cable through Seychelles to Zanzibar and direct to Durban, also with Rodriguez, and through it and Cocos or Keeling island with Fremantle in Western Australia, and with Réunion and Tamatave. The telegraph office at Port Louis is open until midnight.

There is a yearly contract with the British India Navigation Company for a four-weekly mail service between Colombo and Mauritius. Besides the British India steamers, the mails to and from Europe are conveyed by other British and French steamers. The Messageries Maritimes Company perform a bi-monthly voyage from Marseilles to Mauritius and vice versâ, calling at Aden, Zanzibar, Seychelles, Madagascar, and Réunion. The mails for and from African ports are conveyed by the Union Castle steamers. There is also frequent communication by steam and sailing vessels with India, Australia, Madagascar, Réunion, &c. For passages, *see* pages 27-39.

Within the island itself, the means of communication are good, there being in 1909 no less than 130 miles of railway in operation, exclusive of sidings, 341 miles of telegraph, and 87 miles of telephone (exclusive of private services), whilst good roads are to be found wherever required.

General charts 2899, 748a.

Chart 711, Mauritius.

Lloyd's signal stations are provided at Flat island, and at Port Louis mountain, with which vessels can communicate by International code.

There are also signal stations at Butte aux Sable, near Cape Mál-heureux, and at Mount Ory, southward of Grand river entrance.

Current money.—English, French, and Indian coin are in circulation, but a visitor is cautioned not to use English silver for small dealings, as half-a-crown will be treated as a rupee and a shilling as a franc; sovereigns are sometimes at a premium. In 1876, the rupee was established as the standard coin for Government accounts. The French franc at 20 cents is not a legal tender. A dollar is equal to Rs. 2, 10 livres, 100 centimes, or 200 sous. The British postal-order system is in existence.

Weights and measures.—The metric system is in use, but those formerly used in France are also employed.

Time.—Standard time of the 60th meridian of East longitude, or 4 hours fast of Greenwich mean time, has been adopted at Mauritius and its dependencies.

METEOROLOGY.—The monsoons and winds generally experienced in the Southern Indian ocean, as well as the cyclonic disturbances of such frequent occurrence, are fully described in the first chapter, pages 4-7, 11-15; and the description of the winds at Réunion as given at pages 155-157 applies almost equally to its neighbour Mauritius.

Observations are cabled daily by the Eastern Telegraph Company's Superintendent at Rodriguez, and also from Réunion during the cyclone season.

Cyclones, which may be expected at or near Mauritius at any time from November to April, both months inclusive, though rare in either, seldom occur in May or October, and are almost unknown during the intervening months (*see* table, page 12). For a fuller description of these terrible scourges the seaman is referred, amongst others, to the work of Dr. C. M. Meldrum, M.A.*

With the usual threatening appearance of the weather, and the rapidly falling barometer preceding and during the early part of a cyclone, most seamen are familiar. It has been observed, however, at Mauritius, as at Réunion, that the day previous to a cyclone has often been very fine, and frequently the first indication of the approaching tempest has been a tumultuous heaving of the sea, and the breaking of heavy rollers on the coast. *See* pages 11, 157.

The earliest record of a cyclone at Mauritius is as far back as 1695, when it was a Dutch possession. In 1754, it was visited by a

* Notes of the form of cyclones in the Southern Indian ocean, and on some of the rules for avoiding their centres, by C. M. Meldrum, M.A.; reprinted by Meteorological Office, London, 1873.

Chart 711, Mauritius.

severe storm, and in 1778 a violent cyclone wrecked 32 vessels, 300 houses, and a church at Port Louis. In 1868, again, during a violent cyclone a portion of an iron railway bridge across the Grande rivière, 220 tons in weight, was uplifted bodily by the wind and thrown to the bottom of a ravine. In 1874, and again in 1879, in each year in the month of March, a cyclone was experienced; but from that date until April, 1892, there was nothing stronger than a moderate gale. In that year, however, on the 29th of April, occurred the most terrific cyclone the island has experienced. It was preceded by a heavy thunderstorm, which is rarely the case. It was remarkable for the lateness of the date on which it occurred, for the small size of its area, for its short duration, from its having approached from the north-westward (there being only two previous instances of this approach, viz., in 1863 and 1868), and from the extraordinary force of the wind and consequent damage to life and property, about 1,500 lives being lost, 4,000 people badly wounded, one-third of the city of Port Louis destroyed and 30,000 people rendered homeless and ruined.

From 9 a.m. on April 24th to 6 a.m. on the 29th of April, though heavy rollers had set in on the 27th and 28th, the barometer had only fallen from 30·059 to 29·660. From 6 a.m. to 9 p.m. of the 29th its progress is best shown by the table below.

The extreme fall of the barometer was to 27·961 and the maximum wind pressure for five minutes 73lbs., corresponding to a velocity of 121 miles an hour. The centre passed from W.N.W. to E.S.E. over the island about 9 miles southward of the Observatory; its direction can only be accounted for by the whole cyclone having recurved, or by a smaller cyclone having been formed in the south-eastern quadrant of the main storm-field and travelled off to the south-eastward. In the

April 29th, 1892.	Barometer.		Wind.	
	Corrected to Sea Level.	Fall or Rise per Hour.	Mean Direction.	Velocity in Miles per Hour.
6 a.m. -	29·660	—·018	N.E. by E.	22·4
8 " -	29·630	—·015	N.E. $\frac{1}{2}$ E.	34·7
9 " -	29·576	—·054	N.E. by E.	35·0
10 " -	29·480	—·096	N.E. by E. $\frac{1}{2}$ E.	40·0
11 " -	29·338	—·142	N.E. by E.	52·0
Noon -	29·066	—·272	N.E. $\frac{1}{2}$ E.	68·0
1 p.m. -	28·517	—·549	N.E. $\frac{1}{2}$ E.	96·5
2 " -	27·990	—·527	North.	56·0
3 " -	28·034	+·044	W.N.W.	68·0
4 " -	28·520	+·486	W.S.W.	112·0
5 " -	29·059	+·539	S.W.	82·0
9 " -	29·719	+·165	S.Wly.	26·0

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Chart 711, Mauritius.

month of April only ten gales and three cyclones have been recorded since the year 1695, and that now under consideration was fourteen days later than either of the others. By way of comparison it may be mentioned that the greatest velocity of wind recorded in the cyclone of March 21st, 1879, was 80·3 miles an hour, or nearly 41 miles less than that of April 29th, 1892.

In February, 1896, the island was again visited by a cyclone lasting three days, and more remarkable for the extraordinary rainfall than for force of wind. On the 20th, when the wind was at its greatest velocity of 51·3 miles an hour, rain to the extent of 17·34 inches (one fourth of the total amount for the whole year) fell in 24 hours, causing great damage to roads, bridges, and property. *See also* Appendix.

The Royal Alfred Observatory, about 5 miles north-eastward of Port Louis, is in lat. $20^{\circ} 5' 39''$ S., long. $57^{\circ} 33' 6''$ E., about 3 miles from the coast, and 179 feet above the sea; it was removed from Port Louis in 1871. Southward of it is a chain of mountains, the highest peak being 6 miles due South and 2,676 feet above the sea. The barometer cistern is 181 feet above the sea. The thermometers are exposed towards the South. Records of temperature and pressure are obtained by photography; of direction and velocity of wind, by a self-registering anemometer 51 feet above the ground. Magnetic and seismological observations are also made. Time is reckoned by the civil day, from midnight through the 24 hours. It is to be regretted that the extremely unhealthy position of the Observatory may, at no distant date, compel its removal to some more healthful site.

Barometer.—Through a course of 13 years, 1875 to 1887, by hourly observation, it was ascertained that the diurnal variation of atmospheric pressure is as follows:—It is lowest between 1h. and 5h. or 6h. a.m.; also that between noon and 6h. p.m. it is lower than the average for the day; but that about the central parts of the other two periods, viz., 6 a.m. to noon, and 6 p.m. to midnight or to 1h. a.m., it also rises considerably above the daily mean. Thus, taking the mean height for the day at 29·891, and the central hours of the four periods as 4 a.m., 9 a.m., 3 p.m., and 10 p.m., the averages below and above the daily average, expressed by the signs – and +, are as follows:—At 4 a.m., –·017; at 9 a.m., +·030; at 3 p.m., –·039; and at 10 p.m., +·030.

Temperature.—The mean temperature in the shade, as shown in the table of Appendix, is that of 6h. a.m. and 3 p.m., taken in a current of air between two open windows in a lofty room. In the Thermograph screen at the Observatory, the mean temperature for the period of 30 years from 1875-1905 was 74° , the maximum 96° , and

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Chart 711, Mauritius.

the minimum 48°. The temperature naturally varies greatly according to the altitude and general position of the station. Thus, at Curepipe, about 1,800 feet above the sea, the temperature averages about 10° lower than at the Observatory.

Rainfall.—The mean annual rainfall for the whole island, as registered at ten stations during a period of 30 years, 1871-1900, is 76'17 inches. That for the year 1900, at the same ten stations, is only 53'04, showing a deficit for the whole island, as distinguished from the Observatory only, of 23'13 inches, or 30 per cent. below the average; this is the smallest rainfall recorded, with the exception of 1886, when it was 41 per cent. below the average. The greatest fall was at Mare-aux-Vacoas, 115'63 inches; and the least at Port Louis, 17'14 inches. The greater part of the rainfall is during the hurricane months, though the remaining months are by no means dry.

Among extraordinary heavy rains recorded in previous years is that at Sans Souci in 1882, 172'30 inches; at Alma in 1872, 175'24 inches. At the latter place in fifteen years (1872-1886) the mean was 126'69 inches. At Cluny, Grand Port, the mean for twenty-five years (1862-1886) was 142'26 inches; the heaviest being in 1877, viz., 203'5 inches. These figures show how greatly one season may differ from another, and also one locality from another during the same season.

Wind and weather. — The mean force of the wind, by Beaufort scale, at the Observatory for 27 years was 3. The result of many years' observations shows that in ordinary weather the minimum force of wind is between mid-night and 7 or 8 a.m., and the maximum from noon to 3 or 4 p.m. Between December and April is the hottest time, and also the rainy season, when north-easterly winds prevail and lightning is not uncommon; the remainder of the year is comparatively cool. From May to November lightning is never seen. In July and August the S.E. trade wind reaches its maximum strength, being much stronger than in the months immediately preceding and following that period.

Climate.—Taken generally, Mauritius enjoys a fairly healthy climate, especially on the higher levels. The diseases prevalent, though not directly caused by poverty, may be considered to be consequent on poverty, that is to say, on over-crowding, insufficient or bad food, want of clothing, and bad sanitation; but whilst putting poverty in the first rank as the chief predisposing factor in disease, the influence of climate cannot be ignored. Malaria and dysentery, which accounts for over 25 per cent. of the diseases treated in the Government hospitals, prisons, &c., is found to increase and decrease at the same time as the rainfall

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Chart 711, Mauritius. Var. 8° 40' W.

increases and decreases. This is not to be wondered at, as with the advent of rain in the early months of the year, during which the fields are manured, a considerable amount of organic matter is washed to the rivers, which, up to the present (1908), constitute the principal water supply of the greater number of the inhabitants. But the condition is made still worse when there happens to be a very high rainfall which sweeps, in addition, the more or less decomposing organic matters which have accumulated along the banks of the rivers. A serious drought also tends to increase the amount of sickness, as then the rivers run low, become stagnant, and the water supply is again polluted. The death-rate per thousand of population, which in 1897 was 29·5, had risen in 1901 to 40·3, and was still 40·0 in 1908. Bubonic plague first made its appearance in December, 1898, and 1,416 cases were treated in 1899; since then, though with considerable fluctuations, the epidemic has very much diminished, only 224 cases having been treated in 1907. But though the number has so much diminished, the percentage of mortality is still very great, only varying slightly from 81 to 74 per cent. during the 10 years.

ISLANDS and OUTLYING DANGERS.—Mauritius is free from shoals or dangers far detached from the shore except off the northern end, from whence a bank of soundings extends north-eastward about 15 miles, having on it general depths of from 20 to 35 fathoms, but deepening very quickly in all directions towards its outer edge in 100 fathoms, beyond which are ocean depths. Vessels striking soundings on the edge of the bank in thick weather will be in no danger so long as they do not shoal the water to less than 50 fathoms. On this bank are a number of islands and shoals, which will be described before passing round the coastline.

Chart 2899, Chagos archipelago to Madagascar.

Soundings of 34, 36, and 37 fathoms, coral and rock, were obtained by the P. and O. Company's ss. *Soudan*, about 100 miles north-eastward of Mauritius; the sounding of 36 fathoms was situated in approximately lat. 18° 30½' S., long. 58° 43½' E.

Chart 711, Mauritius.

Serpent island.—This small island, with its light-coloured cliffs, is the north-easternmost of the group; it is 530 feet high, and is foul on its north-western and south-eastern sides. It is only 4 cables within the edge of soundings on its northern side, and about 1½ miles within on its eastern side; from it, Flat island lighthouse bears W. by S. ¼ S. distant 9½ miles.

Round island (Lat. 19° 51' S., Long. 57° 47' E.), 1,055 feet high, of barren aspect, though there are a few palm trees on it, is the

General charts 2899, 748a.

Chart 711, Mauritius. Var. 8° 40' W.

highest of the group; it lies $1\frac{1}{2}$ miles south-westward of Serpent island and is inaccessible, except at two places on the western side, where landing may sometimes be effected. It has the shape of a haycock, and can be seen from a distance of 30 miles; in cloudy weather or when the horizon is hazy, it is often made out before the main island. Rabbits are said to be numerous on this island.

Nab reef is a dangerous breaking reef about 5 cables in extent, East and West. Its western end lies W. $\frac{1}{4}$ S. distant $1\frac{1}{2}$ miles from the summit of Serpent island, and N. $\frac{3}{4}$ W. about $1\frac{1}{4}$ miles from the North extreme of Round island. In the channel between Serpent and Round islands, where the tidal streams are very strong, from 3 to 4 knots, the depths are from 17 to 27 fathoms, rocky bottom.

The Blinder is a sunken reef on which the sea breaks occasionally; it lies N.W. by W. $\frac{1}{2}$ W. from the highest part of Round island, its eastern part being 3 cables and its western part 6 cables from the nearest coast of that island. There is a deep narrow channel between the Blinder reef and the north-western side of Round island.

CAUTION.—As both eastern and western streams set with great strength over the Blinder and Nab reefs, and through the channel between Serpent and Round island, sailing vessels should not attempt that channel, as they would very probably get becalmed under the high land of Round island, and drift on the Nab reef. Should a sailing vessel, however, be compelled to pass through, she should if possible be kept in mid-channel, and when between the islands, steer W. $\frac{1}{4}$ S. towards Pigeon-house rock, closely watching the bearing of Serpent island until well clear of the Nab reef.

CAILLE and ABBÉ BANKS.—**La Caille bank**, of coral, is of small extent with a least known depth of 7 fathoms; it lies E. by S. $\frac{3}{4}$ S. distant $7\frac{1}{2}$ miles from Flat island lighthouse; S.S.W. distant $2\frac{3}{4}$ miles from the South extreme of Round island; and 3 miles within the 100-fathoms edge of soundings. The sea breaks occasionally on this bank in heavy weather.

Abbé bank (*Lat. 19° 55' S., Long. 57° 46' E.*), also of coral, is in fact a submerged atoll; it lies S.W. $\frac{1}{2}$ W. distant $1\frac{1}{4}$ miles from La Caille bank, and is about 7 cables in diameter; it is a narrow circular coral ridge, with from 7 to 10 fathoms over it, and from 11 to 18 or 19 fathoms in the centre. On this bank also the sea sometimes breaks in bad weather and occasionally during fine weather.

Between La Caille and Abbé banks there are from 11 to 19 fathoms, coral bottom.

Clearing marks.—Serpent island its breadth open eastward of Round island N. by E. $\frac{1}{2}$ E. leads eastward of La Caille and Abbé

General charts 2899, 748a.

Chart 711, Mauritius. Var. 8° 40' W.

banks in 30 fathoms; Flat island lighthouse W. by N., or Gunner's Quoin W. $\frac{3}{4}$ S., leads northward of both banks in from 25 to 30 fathoms; and Flat island lighthouse N.W. $\frac{1}{2}$ W., or Gunner's Quoin W. $\frac{3}{4}$ N., leads southward of them in 22 or 23 fathoms; a closer but perfectly safe mark to clear the Abbé bank on its southern side is Canonnier point lighthouse in line with Cape Malheureux W. $\frac{3}{4}$ S.; this leads within $2\frac{1}{2}$ cables of the Abbé bank.

Flat island.—This, the north-western island of the group, lies $6\frac{3}{4}$ miles westward of Round island; the surface is generally flat, but the south-western extreme rises to a hill, 310 feet high; Flat island is about $1\frac{1}{4}$ miles long, North and South, and nearly a mile wide at its southern part; a shoal projects a short distance from its western side, and its eastern and south-eastern sides are very foul. On the eastern side is a flagstaff and a semaphore, and on the western side also is a flagstaff.

LIGHT (*Lat. 19° 53' S., Long. 57° 39' E.*).—On the summit of the island stands a lighthouse, a white tower 53 feet high with a red lantern, from which is exhibited, at 364 feet above high water, a *white revolving light, visible twenty seconds every minute*; in clear weather it should be seen from a distance of 25 miles. It is obscured by Round island. (*See Light list and Chart.*)

Lloyd's signal station.—Vessels can communicate by International code with the signal station at Flat island.

There is also a signal station at Butte aux Sable, one mile south-eastward of Cape Malheureux.

Pigeon-house rock, 172 feet high, lies off the North extreme of Flat island, leaving a narrow boat passage between, and having deep water on its northern side, which may be safely passed from 3 to 5 cables distant.

Gabriel island, 70 feet high, lies 3 cables south-eastward of Flat island, and is joined to it by reefs; a small islet, 6 feet high, lies close southward of Gabriel island.

Quarantine station.—On the south-western extreme of Flat island is the cholera quarantine establishment for Mauritius; and the whole island, including Gabriel island and 200 yards of water around them, is included in the quarantine area. It is in signal communication with Port Louis. When the station is actually in quarantine, two yellow flags are kept constantly flying.

Sandringham reef, on which a vessel of that name was wrecked, lies S.E. distant $1\frac{3}{4}$ miles from Flat island lighthouse, and 4 cables from the South extreme of the 6-feet islet southward of Gabriel island. There are 17 fathoms water at one cable southward

General charts 2899, 748a.

Chart 711, Mauritius. Var. 8° 40' W.

of the reef. As the tides set with great strength over Sandringham reef, it should be given a wide berth.

Rip bank, on which the sea breaks occasionally without warning, is of coral formation, about 2 cables in extent N.E. and S.W., with from 7 to 9 fathoms water over it, and lies S.E. distant 4 to 7 cables from Sandringham reef.

At 4 cables south-eastward of this bank, there are 23 fathoms, coarse sand and coral.

Clearing marks.—The N.E. extremes of Flat and Gabriel islands in line N.W. by N., lead north-eastward of Sandringham reef and of Rip bank; Flat island light on a similar bearing leads past their south-western side; and the highest part of Gunner's Quoin bearing W. by S. $\frac{1}{4}$ S. or Canonnier point lighthouse open southward of the south-eastern extreme of Gunner's Quoin, leads southward.

Anchorage.—There is anchorage near the southern end of Flat island in 9 fathoms, sand and coral, with its lighthouse bearing N.W. by N., distant about one mile, and the summit of Serpent island in line with the 6-feet islet southward of Gabriel island E.N.E. As the sea rises quickly with southerly winds and the holding ground is not good, vessels should proceed to sea on any indication of bad weather. If required, a pilot will be sent from Port Louis to vessels at anchor off Flat island.

Gunner's Quoin (*Lat. 19° 56' S., Long. 57° 37' E.*).—This small triangular island, about 8 cables long N.W. and S.E., lies N.N.E. distant 2 miles from Cape Malheureux, the northernmost point of the island of Mauritius; the hill from which the island takes its name is 518 feet high, and is at the western extreme of the island. Foul ground extends from the northern and southern extremes, and also fringes the eastern side of this island, but the western end is steep-to.

The Blacksmiths are a cluster of rocks, one being 3 feet above water, and the rest awash at low water; the outer part lies N.E. by E. $\frac{1}{4}$ E. distant 3 cables from the north-eastern extreme of Gunner's Quoin. There are 17 fathoms water, rocky bottom, 2 cables northward of the rocks.

The Carpenters are three rocks awash, on which the sea breaks heavily. The outer rock lies S.S.E. distant 2 cables from the southern extreme of Gunner's Quoin. At 2 cables southward of these rocks, the depth is 17 fathoms, rocky bottom.

CAUTION.—The east-going or flood stream sets with great strength over the Carpenters and Blacksmiths, causing dangerous

General charts 2399, 748a.

Chart 711, Mauritius. Var. 8° 40' W.

rices, which extend 3 miles off Gunner's Quoin. Vessels should not pass within a mile of the island on either side.

Mapu patch, lying North distant $1\frac{3}{4}$ miles from Mapu village, and 6 cables outside the coastal barrier reef, is a small coral knoll with 7 fathoms over it, having close-to, on its northern side, 23 fathoms rocky bottom; and on its southern side, 15 fathoms coral.

Malheureux rock is a small coral knoll with 29 feet over it, lying N.N.W. about $1\frac{1}{4}$ miles from Cape Malheureux. Another 5-fathoms coral patch, with from 7 to 9 fathoms between it and the barrier reef, lies E. by S. $\frac{1}{2}$ S. distant 7 cables from the Malheureux rock. Flat island lighthouse open of the southern extreme of Gunner's Quoin, the latter bearing E. by N. $\frac{3}{4}$ N., leads clear of both rocks, but very close north-westward of the Malheureux rock.

Tides and tidal streams.—It is high water, full and change, at the northern part of Mauritius, at 0h. 30m.; springs rise 3 feet. The streams among the islands run, during springs, from 4 to 5 knots, causing dangerous races. At neaps, the strength of the stream seldom exceeds 2 knots. The night are stronger than the day tides, and the strongest streams occur two days after full and change of the moon.

The east-going or flood stream begins 5 hours before the moon's meridian passage and runs for 6 hours; the west-going or ebb stream then makes and runs for 6 hours, there being no slack water. During the east-going stream there is a strong set towards Canonnier point and the reefs off it, the stream sweeping through Quoin channel and round the North end of Mauritius with great strength. During and after westerly winds this set is greatly accelerated. On the bank of soundings, among the islands, this stream takes an easterly direction, but with strong southerly winds it is deflected north-eastward.

The tidal streams separate at low water off Piment point, the northern point of Arsenal bay, on the north-western coast of Mauritius, the line of separation working north-eastward towards Rocky point, which it reaches by the time of high water. While the east-going stream is setting round the northern part of the island, a weaker stream is setting southward along the western coast. The ebb or west-going stream sets generally about W.N.W. past the northern end of the island, but is very little felt on the western side between Canonnier and Caves points. The in-shore stream turns two hours before the stream in the offing, and during the last half of the flood, near Gunner's Quoin, sets eastward at the rate of 4 knots; and on the Mauritius coast, skirting the 10-fathoms edge of the bank, the ebb or west-going stream runs at 3 knots an hour.

General charts 2899, 748a.

Chart 711, Mauritius. Var. 8° 40' W.

Directions.—The clearing marks already given are a sufficient guide when passing between the islands; but attention is directed to the following soundings:—

At about 10 miles E. by S. from Flat island light, the soundings are 29 fathoms, coarse brown sand mixed with broken shells and coral; and, at 6 miles from the light on the same bearing, the same depth, but the bottom black and white speckled sand.

With Flat island lighthouse bearing N.N.W. $\frac{1}{4}$ W. distant 10 miles, the depth is about 30 or 35 fathoms, fine white sand; and a vessel in that position is then about 2 miles from the barrier reef abreast of Amber island, and just within the 100-fathoms edge of the bank; these soundings vary as the light is neared from 27 to 25 fathoms, the nature of the bottom changing from fine white sand to coarse brown sand mixed with shells and coral.

At 3 miles from the light, on the same bearing, the depth is 23 fathoms, and from thence a W. $\frac{3}{4}$ N. course should be steered. Proceeding on that course, the depth will decrease to 20 and 18 fathoms, coarse brown sand and shells, on the tail of the bank which extends southward from Flat island, and again deepen to 22 and 23 fathoms, coarse brown sand, when Flat island bears N.N.E. A farther run of $2\frac{3}{4}$ miles from this point on the same course will place the vessel out of soundings westward of the bank.

Sailing vessels, or steam vessels of small power, arriving off Round island during the east-going stream, should pass northward of Serpent island and give the Pigeon-house rock a berth of at least one mile.

A sailing vessel becalmed among these islands should anchor to avoid being drifted about by the strong tidal streams.

Canonnière point.—LIGHT (*Lat. 20° 0' S., Long. 57° 33' E.*).—This projecting point lies W. $\frac{3}{4}$ S., distant $3\frac{1}{2}$ miles from Cape Malheureux; on its extreme is the lighthouse, a white tower, from which is exhibited, at 89 feet above high water, a *fixed white* light with a *red* sector, visible in clear weather from a distance of 10 miles. The light-keeper's dwelling is also painted white.

For sectors, *see* Light lists and charts.

Quarantine station.—The quarantine establishment for small-pox is on this point, enclosed by a stockade, and the adjacent water to the distance of 200 yards is included by law within the quarantine limit. When the station is in a state of actual quarantine, two yellow flags are kept constantly flying.

General charts 2899, 748a.

Chart 711, Mauritius. Var. 8° 50' W.

Reefs.—Canonnière point is surrounded by reefs to a distance of 6 or 7 cables, immediately outside of which the water deepens so rapidly that the 100-fathoms line is less than a mile from the point. Amongst the most dangerous of the reefs is the Whale rock, with only 4 feet over it, N. by W. distant $4\frac{1}{2}$ cables from the lighthouse. Another rock, with 18 feet water, having 9 fathoms close outside and 50 fathoms $2\frac{1}{2}$ cables beyond, lies 6 cables N. by W. $\frac{1}{4}$ W. from Canonnière point lighthouse, and N.W. by N. distant $1\frac{1}{2}$ cables from Whale rock.

The summit of Serpent island open of the western extreme of Gunner's Quoin bearing E.N.E. leads to the northward of the rocks off Canonnière point (*see view on chart*). By night, Flat island light bearing N.E. by E. leads northward of these rocks.

CAUTION.—There is a dangerous indraught towards Canonnière point, especially when the flood or east-going stream is running; vessels under sail, from the northward, should therefore give the point a berth of $1\frac{1}{2}$ miles when passing or rounding it.

N.W. Coast.—Immediately eastward of Canonnière point is a shallow inlet, known as Grand bay, with a village on its eastern shore; the bay is remarkable historically as being the spot where the expeditionary force sent to reduce the island, in 1810, consisting of about 10,000 men, was landed. Buttes aux Papayers, 530 feet above the sea and $3\frac{1}{4}$ miles inland from the head of the bay, in line with the black rocks off Matson point, the eastern inner point of the bay, bearing S. by E. $\frac{1}{2}$ E., leads up to that point across the reefs in from 9 to 12 feet water. There is a semaphore and two signal masts at Butte aux Papayers, but they are not now used. After rounding Matson point, the water deepens to 3 or 4 fathoms in the small basin which forms the head of the bay.

Between Canonnière point and Port Louis, the coast is fringed by reefs from 3 to 5 cables wide, and is broken by a few indentations, only two of which, known as Arsenal and Tombeau bays, are of the least importance.

Plan 3085, Tombeau and Arsenal bays.

Arsenal bay (*Lat. 20° 5' S., Long. 57° 30' E.*).—This small bay is about $2\frac{1}{2}$ cables wide between the reefs at the entrance, and recedes about 3 cables to its head, where the surplus water of the River Pamplémousses runs into it over a dam constructed about 700 yards up the river. There is a depth of about 7 fathoms in the entrance of the bay, and $3\frac{1}{2}$ fathoms within $1\frac{1}{2}$ cables of the conspicuous cliff at its head on the southern side of the river. This bay is too confined to afford good anchorage at any time, and, on the least appearance of a westerly wind, it should be quitted at once, as a swell quickly sets in and breaks very heavily on the reefs around.

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Plan 3085, Tombeau and Arsenal bays. Var. 8° 50' W.

There are sugar plantations around the bay, with the usual accessories of factory, distillery, &c., and a road direct to Port Louis.

Tombeau bay, about 3 miles northward of the entrance to Port Louis, and one mile southward of Arsenal bay, closely resembles the latter in most respects, but is more than double its size, and, consequently, affords good anchorage in about 5 fathoms with all but westerly winds. It is easily entered, as the reefs extending from the shore are plainly visible at all times of the day, and the holding ground is fairly good. The River Tombeau, an insignificant stream, flows into the head, and is almost dammed by a shifting sand-bar. There is a road to Port Louis, but the best mode of communication for a vessel is with her own boats; they must, however, go outside the reef for safety, though, with local knowledge, small boats, skiffs, &c., can always find a passage inside the reef in smooth water.

Supplies.—Fresh provisions have to be obtained from Port Louis, but the contractor will always send the necessary supplies round to Tombeau in his own boats.

Tides.—It is high water, full and change, 0h. 40m.; springs rise 3 feet, neaps 2 feet.

Plan 713, Port Louis.

PORT LOUIS (*Lat. 20° 9' S., Long. 57° 30' E.*), the principal harbour of Mauritius, is on the western side of the island at 13 miles from the northern extreme; the entrance is between reefs on which are islands and forts; on the star-board hand in entering is Barkly island, a strip 3 cables long and parallel with the channel, and just beyond its inner end on low land is Fort William. On the port hand, 4 cables within the outer edge of the reefs, is Fort George standing on Tonnelier or Cooper island, and connected with the city by a causeway; eastward and north-eastward of the fort is a large space of marshy lagoon country commonly called the Mer rouge. The entrance is $1\frac{1}{2}$ cables wide between the coral reefs, and lies N.W. and S.E., expanding within to a basin 7 cables long and 5 cables wide, but with shoal water extending a considerable distance from both sides; at the head of this basin is the city of Port Louis, the capital of the island, with a railway line running along near its sea front, with the principal station close to the southern angle of the port.

The harbour has been dredged and steamers can now come in much closer than formerly, but much remains to be done to facilitate entry and discharge of steamers. New moorings will be laid down as soon as funds are available; and the provision of increased quay space and shed accommodation has only been delayed through want of funds.

General charts 711, 2899, 748a.

Plan 713, Port Louis. Var. 8° 50' W.

A scheme for the provision of piers to take large vessels alongside has been prepared, but the cost is prohibitive, and likely to remain so for years.

Port Louis presents a picturesque appearance from the offing, *see* view on plan, as steep hills rise immediately behind it, and in the background are the remarkable mountains known as the Pouce or Thumb, so named from the resemblance to a thumb held upright, of which the summit is a narrow ridge about 50 feet long, North and South, and only from 6 to 12 feet wide; and Pieter Both mountain, surmounted by a curious knob, and already mentioned at page 107. These mountains are 2,650 and 2,676 feet high respectively, and form a part of a chain lying 2 miles south-eastward of Port Louis, from which chain spurs extend in a northerly direction.

The Citadel, on a hill 289 feet high rising in the centre of the city, is a prominent object; as is also Cassis church, with two conspicuous square towers, and Signal mountain, 1,061 feet high, rising over the western side of the port. The lagoons and marshy grounds in the vicinity of the harbour are being gradually filled up and planted with trees; the sides of the hill have also been planted.

Depths, &c.—As elsewhere round the coast of Mauritius, except at the northern end, the lead is no guide until close in with the land. At $1\frac{1}{2}$ miles from the reefs in the entrance to Port Louis, a vessel is out of soundings; at one mile from them she is in from 30 to 40 fathoms, quickly shoaling to 16 and 10 fathoms as the entrance is neared, and to 9, 8, and 7 fathoms in mid-channel until nearly abreast of the forts. Just inside the forts, the 5-fathoms limit is reached, and from thence toward the head of the harbour an area about $4\frac{1}{2}$ cables long and one cable wide has been dredged to a depth of 29 feet. A depth of $3\frac{1}{4}$ fathoms can be carried into the eastern arm of the port, known as the Trou Fanfaron, on the northern side of which are the dry docks.

The port jetty, at the head of the harbour abreast of the turn into the Trou Fanfaron and close to the hospital and railway station, has 12 feet water alongside of it.

Pilots. — Pilotage is compulsory as regards all merchant vessels of 100 tons register and upwards, but only half pilotage is charged where vessels enter solely to obtain supplies of coal, water, or provisions. The pilots are under the Harbour Master, and accompany the Health officer when he boards vessels.

General charts 711, 2899, 748a.

Plan 713, Port Louis. Var. 8° 50' W.

Pilotage dues accrue entirely to the public treasury ; a pilot has to obtain a certificate of services rendered, and also to report to the Harbour Master any breach of the port regulations which may come to his knowledge.

Steam-tugs are always available.

DOCKS.—*See Appendix.*

Chart 711 and Plan 713.

LIGHT (*Lat. 20° 11' S., Long. 57° 25' E.*).—On Caves point, about $4\frac{1}{2}$ miles south-westward of the entrance to Port Louis, is exhibited from a white tower with two broad red horizontal bands, 97 feet high, at an elevation of 152 feet above high water, a *group flashing white light*, showing a group of two flashes every ten seconds, thus:—flash, one quarter of a second; eclipse, one and a half seconds; flash, one quarter of a second; eclipse, eight seconds. The light should be visible in clear weather from a distance of 18 miles. A subsidiary *fixed red light* is also exhibited, at an elevation of 100 feet, from the north-eastern side of the tower, and should be visible from a distance of 10 miles. For arc of visibility, *see Light list.*

The *red light* shows over the outer anchorage of Port Louis, and vessels should anchor well within its western limit, or they will not be in soundings.

Plan 713, Port Louis.

Buoyage, &c.—The north-western extreme of the shoals on the north-eastern side of the entrance is marked at a distance of $4\frac{2}{3}$ cables N. 118° E. from Barkly point by a *white occulting light-buoy* with red and white vertical stripes, in 8 fathoms; and the outer edges of the shoals extending from the shore on both sides within the entrance are marked by buoys, black on the north-eastern side, and red on the south-western side. After a cyclone, it sometimes happens that the whole of the buoys are found to have been washed away. In the interior of the harbour are many mooring buoys, but their positions are being constantly shifted.

DIRECTIONS.—In order to avoid getting becalmed under the high land near the south-western part of the island, sailing vessels from the southward bound to Port Louis should pass along the eastern side and round the northern end of the island. At night, having

General charts 711, 2899, 748a.

Chart 711 and Plan 713. Var. 8° 50' W.

sighted Ile Fouquet light at the entrance of Grand Port, it should not be brought eastward of N. by E. nor approached nearer than 4 miles. On this bearing and distance, a vessel will be one mile outside the 100-fathoms edge of soundings, and may steer N.E. $\frac{1}{4}$ E. about 10 miles, and from thence N. by E. $\frac{1}{2}$ E. about 7 miles; Flat island light should then be seen bearing N.N.W. $\frac{1}{4}$ W., and may be steered for on that bearing, the northern end of the island being rounded in accordance with the description and directions already given on pages 113-118.

Sailing vessels approaching Port Louis at night, for which Caves point light is an ample guide, should do so under easy sail, and, unless under favourable circumstances, the coast should not be approached nearer than 3 miles.

Sailing vessels generally enter the harbour in tow of a steam tug, but should the wind be fair for entering under sail, there is not room inside for a large vessel to *round-to*; it is advisable to have hawsers ready to run out astern as well as ahead. Merchant shipping lie in tiers, moored head inshore, leaving a channel up the middle just wide enough for the traffic.

For vessels anchoring in the Outer roadstead, the following is the advice of a former experienced Harbour Master:—From the moment of anchoring, be ready to slip and put to sea if necessary. Use chain for a buoy rope, as coral cuts the thickest rope in 48 hours. If the signal is made to put to sea, do so at once and never attempt to *ride it out*. When slipping from this anchorage from stress of weather, note the direction in which the wind shifts and run the vessel in the opposite direction until clear of the land, when an easterly course will take her into fine weather. Never heave-to with the vessel's head towards the shore; in bad weather, local currents are often very strong and uncertain in direction; many vessels, in the belief that they had made a sufficient offing, have been hazarded, and some lost, through neglecting this precaution.

At night.—Vessels approaching Mauritius from the westward, having picked up Caves point light, should pass it at a distance of from one to $1\frac{1}{2}$ miles on an E.N.E. course until the light-buoy at the harbour entrance is seen. As soon as the light-buoy bears East haul in towards it, and anchor as recommended.

Vessels approaching Port Louis from the northward should keep Canonnier point light open of the land until the light-buoy is seen, and when the light-buoy bears South haul in and anchor as recommended. The *red* subsidiary light at Caves point should not be opened, coming from either direction, until the light-buoy is sighted.

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Plan 713, Port Louis. Var. 8° 50' W.

Outer anchorage.—The outer roadstead and usual anchorage off Port Louis, formerly known as the anchorage at the bell-buoy, is in from 15 to 20 fathoms, coarse sand mixed with broken coral and shells, with the light-buoy bearing between East and South, distant about 2 to 4 cables. A vessel will have entered the anchorage ground when Gunner's Quoin is in line with a conspicuous gap in the trees near Rocky point bearing N.E. $\frac{1}{2}$ N., *see* view on plan, and may anchor as convenient westward of an imaginary line drawn from the light-buoy to the martello tower on the south-western side of Great river bay. At night vessels should anchor well within the western limit of Caves point *red* subsidiary light.

The quarantine anchorage (*Lat. 20° 8' S., Long. 57° 28' E.*) is in 12 fathoms, coarse sand and coral, southward of a line joining Pouce or Thumb mountain and Fort William, with the light-buoy bearing about E. $\frac{1}{2}$ N., distant 6 cables; two small black buoys for the use of the quarantine guard boat are moored between the anchorage and Barkly point. Vessels in quarantine are, however, allowed to enter the harbour in order to coal in smooth water.

Inner anchorage.—The undermentioned area has been dredged to a depth of 29 feet at low water springs; this area is included between imaginary lines drawn between the following positions:—

(a) Positions situated at distances of $2\frac{1}{2}$ cables N. 33° W., and $2\frac{9}{10}$ cables N. 58° W., respectively from the port jetty head.

(b) Position situated at distances of $2\frac{8}{10}$ cables S. 5° W., and $3\frac{7}{10}$ cables S. 16° W. respectively from the martello tower, Fort George.

The north-western boundary of this area, as given above, is only approximate, a small irregular space having been dredged northward of it.

The Harbour Master berths vessels and lends every assistance in laying out anchors, &c., mooring lighters being kept for this purpose. Vessels are usually given one set of moorings ahead and a buoy astern, one bower anchor being dropped in the middle of the channel.

SIGNALS.—Lloyd's signal station.—There is a signal station at Signal mountain, at 1,061 feet above the sea, with which vessels can communicate by International code.

There is also a signal station at Mount Ory, 1,131 feet above the sea, about 3 miles southward of the entrance to Grand river.

Time signal.—On the Port tower, adjoining the Port Office, a white ball, 4 feet in diameter, on iron framework mast, having a drop of 20 feet, elevated 54 feet above the ground, is dropped daily, by electricity, except on Sundays and public holidays, at 21h. 0m. 0s. Greenwich mean time, corresponding to 1h. 0m. 0s. Mauritius standard time.

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Plan 713, Port Louis. Var. 8° 50' W.

The ball on Signal mountain is dropped by hand at the same time.

The ball is hoisted at half-mast 5 minutes before the signal and close up at 2 minutes before.

Should the ball not fall correctly at 1h. 0m. 0s., Mauritius standard time, it will be lowered to half-mast, and at 1h. 58m. 0s. again hoisted close up, and dropped at 2h. 0m. 0s. This will be repeated each hour until the signal is made correctly.

Should the ball not be in working order, letter D flag, International code, will be hoisted at 1h. 0m. 0s.

A signal is sent from the Observatory every hour to regulate the clock in the Port tower, and this is repeated one minute later in case the first signal should have been missed.

Masters of vessels requiring a chronometer comparison, may obtain telephonic time signals from the Observatory between the hours of 1 p.m. and 2 p.m.

Cyclone signals.—On the approach of bad weather, the following signals are made to vessels in the harbour and roadstead from the flagstaff of the Port office, at the head of the harbour, and repeated from Fort George.

Day signals.

A white flag, with blue horizontal stripes and ball above, at the Port office, repeated at Fort George, and accompanied by a gun.

A red flag, with a ball above.

Send down top-gallant yards and prepare for bad weather. The masters of all ships and vessels in this port are required immediately to repair on board their respective vessels, and half the crew should be kept on board; vessels at the Outer anchorage ought to proceed to sea.

Vessels in the port are to strike lower yards and topmasts. Vessels at the Outer anchorage to go to sea.

Note.—The signals are respectively confirmed by a gun from Fort George. Vessels are required to answer the above by hoisting their national ensign at the main.

Night signal.

One blue light at the Port office repeated at Port George, and accompanied by a gun.

Vessels at the Outer anchorage to proceed to sea forthwith, and vessels in the port to make every preparation for bad weather.

Trade.—For trade, &c., see page 108.

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Plan 713, Port Louis. Var. 8° 50' W.

Supplies.—Fresh provisions and all the usual requirements of a vessel are readily obtained. There is an excellent market, where meat, fish, poultry, vegetables, and fruit are sold, and sometimes hares, partridges, and other game.

There is a large Hospital in Port Louis, where seamen requiring treatment are received; also a Sailors' Home, with special accommodation for seafaring men.

Tides.—It is high water, full and change, at Port Louis, at 0h. 30m.; springs rise 3 feet, neaps 2 feet.

Water.—Tolerably good water (but it is advisable to boil and filter it for drinking purposes) is supplied from the town fountain at the foot of the harbour in two steam tanks of 150 tons each.

Coal.—About 52,000 tons are imported annually, 15,000 tons being usually kept in stock. There are two coal wharves, the British India Company's wharf, 82 feet long, with from 2 to 4½ feet of water alongside it, and that of Blyth Brothers, 200 feet long, with from 3 to 6½ feet of water alongside it. The Admiralty stock of patent fuel is in the custody of the Harbour Master. The coal is conveyed alongside in the harbour by lighters, and from 400 to 500 tons can be shipped in one day, provided there is no detention in trimming. There is no wharf alongside of which vessels can coal; and coaling in the Outer roads is dangerous if there is any sea on, the lighters being only fit for work in smooth water.

When vessels in quarantine coal lying at one of the mooring buoys in the harbour, it is customary to tow the lighters to a buoy to windward of the vessel, from which they have to be brought by the vessel's own crew, cleared by them, and returned to the buoy when empty.

Repairs.—Large repairs to hull, machinery, and boilers can be effected at Port Louis, an abundance of material being always available; heavy work can be done under contract by the Société des Forges et Fondries de Maurice, who can make pistons and shafting for large vessels; they possess several cranes, and one capable of lifting 25 tons, also two steam hammers, and can run 6 tons of iron or 2½ tons of brass in one casting; their largest lathe is 10 feet in diameter. The business of this company is, however, principally with sugar-making machinery; their plant includes rollers for plates and pipe-bending machines; but their works are a mile from the harbour.

The Port harbour trust do repairs to tugs, pilot boats, &c.; at the Port office workshops 50lbs. of iron can be melted and run out at one time; there is also a turning machine which can turn out shafts 29 inches in diameter and 12 feet long. The Railway works, Plain Laizare, have a steam hammer available which can work one ton of iron or 5 cwts of metal. The Government has a 25-ton crane, on

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Plan 713, Port Louis. Var. 8° 50' W.

Fountain quay, worked by hand, but it is not considered safe for weights above 20 tons.

Climate.—This subject as regards the whole island has been discussed at pages 112, 113; it only remains to be said of Port Louis that it has the unenviable reputation of being the most unhealthy part of the island; it has had its full share of all epidemics visiting the island, and the poorer part of the town being so densely populated, there is naturally a great dread of infection.

REGULATIONS for PORT LOUIS.—It is very desirable that captains about to visit Mauritius for the first time should have a general knowledge of these regulations prior to arrival. A small book called “Port, Customs, and Quarantine Regulations,” in French and English, should be obtained on arrival to supplement and complete the information given in the Abstract. The following is an abstract:—Pilots and not the Government being responsible for any damage caused by default in the execution of their duty, it is open to any person aggrieved by the act of a pilot to sue him for damages, but at his own risk as to cost, and he may recover from such pilot or his sureties the amount of his security bond or such portion of it as to a competent court may seem just. Though vessels of less than 100 tons need not employ a pilot, they are in everything subject to the Harbour Master’s directions when within the limits of the port.

Ensign, &c.—No merchant vessel of any nation whilst in the harbour or outer road is permitted to hoist at any masthead any pendant or thing resembling a pendant, or to fly any other ensign than such as is allowed by law.

Gunpowder, Guns, Fire, precautions, &c.—No merchant vessel is allowed to enter the harbour with any gunpowder or other explosive on board, except with special permission from the Harbour Master, nor to ship gunpowder or fire guns in the harbour. The unloading or loading of gunpowder is done at the Outer anchorage, as from time to time directed by the Harbour Master. Smoking vessels for the destruction of vermin when in the harbour is only allowed on application to the Harbour Master, and if permitted by him, is only to be done under the strict supervision of himself or his officers, and in such manner and at such times as he or they may direct, and with such precautions against fire as he may deem necessary.

Vessels shipping hay in any quantity above 20 bales must quit the harbour before night. Lighters or boats laden with hay, cotton, or other goods liable to spontaneous combustion, have to anchor for the night well clear of all shipping, and to be securely covered in with tarpaulins. Pitch, tar, and other caulking materials requiring to be

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Plan 713, Port Louis. Var. 8° 50' W.

boiled, are to be so treated in a boat or on a stage alongside the vessel requiring them.

In case of fire amongst the merchant shipping, every vessel in the harbour is required to send buckets, axes, mauls, and anything useful in such cases, to the scene of fire, together with as many men under an officer as can be spared, the whole to be at the disposal of the Harbour Master, whose lawful orders they are bound to execute.

Mooring, Securing, &c.—No merchant vessel except a mail steamer is allowed to enter the harbour until her jibboom is run in. From April to December, though all vessels are to take such precautions for safety as the Harbour Master may direct, two bower anchors ahead and one bower anchor stern are deemed sufficient; but, from December to April, both months inclusive, every vessel is required to be moored with two bower anchors and chains both ahead and astern; also, at this season, to keep their top-gallant masts and yards on deck, and top ropes and jeers rove in readiness to strike lower yards and topmasts, if so directed.

On any appearance of bad weather, all masters should repair on board their vessels, and be prepared to act in accordance with such directions as may be given by the Harbour Master, or signals made. *See Cyclone signals, page 125.*

During the day, there shall always be at least one man, and during the night two men, on board every vessel in port; if necessary the Harbour Master is empowered to procure such men at the expense of the vessel.

In order to keep the harbour channel as clear as possible, outside vessels on either side of the channel are not allowed to load or unload on the outer but on the inner side of the vessel; they are also required to have their lower yards topped. In no part of the harbour are guess-warp booms permitted, nor warps obstructing the harbour.

Ballast, rubbish, &c.—No ballast, dunnage, mats, or rubbish may be thrown overboard from any vessel, nor from the shore into the harbour; nor may any ballast be thrown overboard in the roadstead in less than 30 fathoms. A boat is sent round once a week to every vessel to take away upper deck and galley sweepings.

Police.—When any vessel requires police assistance, Flag H of the International code should be hoisted at the main, and the Police boat will at once repair to the vessel. Should the signal be made from the land, the non-commissioned officer or constable in charge will proceed to the spot to ascertain the cause, and act accordingly.

Bathing, nude, in any part of the harbour between sunrise and sunset, is forbidden under a penalty. Bathing at any time and

General charts 711, 2899, 748a.

Plan 713, Port Louis. Var. 8° 50' W.

under any circumstances is exceedingly dangerous, as large sharks infest the harbour.

Landing.—The wooden steps at the N.W. end of the Customs quays, and the stone steps on the N.E. side of the fountain, are kept clear for landing places, no boats being allowed to make fast at either place nor to remain longer than is required to embark or land their passengers. Government boats only may land at the quay in front of the Port office.

Wrecks, Salvage, &c.—Owners or masters of sunken or stranded vessels in the harbour or roadstead may be required, with due notice, to clear away such sunken or stranded vessels; and, in default, the Harbour Master will cause the same to be removed, the expenses being borne by the owner or master, &c., without prejudice to penalties. All anchors and cables found in the harbour, not fast to a vessel or boat, may be taken and removed by the Harbour Master, and will not be restored to the owner until all expense incurred and salvage due shall have been paid to the Harbour Master.

At the expiration of twelve months, if such things have not been redeemed as above, they will be sold for the benefit of Government.

Customs.—The Customs regulations closely resemble those in force in other British colonies, with such local variations as the circumstances of the port require:—Masters have to give notice in writing at the Port office of their intended departure; sailing vessels 24 hours' notice, steamers 6 hours. The Harbour Master may defer the swinging of a vessel if he deems it necessary to do so. A vessel should sail if possible directly after she is swung, and if she does not leave within 24 hours, the Harbour Master has authority to remove her if he thinks fit at the expense of the vessel.

Quarantine.—All strangers require to obtain *pratique* before communicating with the shore, and no vessel can enter any port in Mauritius without receiving *pratique*, unless permitted to do so in strict quarantine, by the properly constituted authorities. Small coasting vessels of the island hoist a square dark blue flag to distinguish them from strangers requiring *pratique*. The Health officer in boarding a vessel is accompanied by a Port officer, and the master of the vessel is required to sign a declaration on a form provided and duly filled up by him; he has also to give a muster-roll of the crew and a list of passengers. When these formalities have been

General charts 711, 2899, 748a.

Plan 713, Port Louis. Var. 8° 50' W.

observed, and if the vessel does not require to be placed in quarantine, a red flag is hoisted at the fore as a signal that the vessel has free *pratique*, or free communication with the shore. Despatches and letters are then to be forwarded to the Post office.

Vessels placed in quarantine hoist the yellow flag at the fore; those under suspicion of infectious disease are placed in provisional quarantine, and hoist a coloured flag below the yellow flag. From sunset to sunrise, a light is shown at each fore-yard-arm. Special arrangements are made for coaling vessels in quarantine, *in the harbour*, the difficulty and danger of doing so in the Outer roads being very great. *See Coal*, page 126.

Vessels performing quarantine in the roadstead are to have all boats hoisted up by sunset and not to be approached within 200 yards; any person doing so will incur the same penalty as though breaking out from quarantine; any person attempting the latter may be brought back by force and, if necessary, fired on. In all cases, persons coming within the quarantine boundary, whether inadvertently or not, are at once in quarantine. Any animal dying on board a vessel in quarantine is to be weighted and sunk near the light-buoy.

If quarantine be continued, passengers and immigrants are landed at the stations at Flat island or Canonnière point, as the case may be, and the vessel performs her quarantine in Port Louis roads. All vessels with immigrants call at Flat island for examination. Should the Health officer at Flat island not go on board but show a white flag with a blue cross, the vessel may at once proceed to Port Louis roads to be there dealt with.

Any concealment of disease or refusal to answer proper questions by captains, medical or other officers or persons, subjects all such persons to very severe penalties; as do all or any breaches of the quarantine laws by all persons:—thus, a person going on board a vessel before she has received *pratique* and re-landing is liable to a fine of £50. Some fines are much heavier, and imprisonment is a common penalty.

All vessels sailing from a port where there is a British Consul and arriving at Mauritius unprovided with a Bill of Health, will be subject to 21 days' quarantine of observation unless they have been upwards of 21 days at sea on the passage.

Chart 711, Mauritius.

WEST COAST.—Westward of Port Louis, the coast is bordered by a barrier coral reef at a distance of 7 or 8 cables, continuing for about 2½ miles to Pointe au Sable; from thence the coast trends south-

General charts 2899, 748a.

Chart 711, Mauritius. Var. 9° W.

westward, and is free from reef as far as Petite Rivière bay, which is rocky; at the side of this bay stands a village, with the passage leading to it defended by a battery. The light at Caves point is described on page 122.

For $3\frac{1}{2}$ miles south-westward from Petite Rivière, there is no reef, and the water is deep close under a continuation of rugged cliffs from 12 to 26 feet high. Within this space, $2\frac{1}{2}$ miles from Petite Rivière, is Belle Île river, which flows from the Corps de Garde mountain 4 miles inland; it is shallow at the entrance and fordable. Two other small streams, the Dragon and Galets rivers, enter the sea within a mile southward of Belle Île river.

Southward of the cliffs, the shore becomes low and shingly, bordered by a barrier coral reef about 5 cables off-shore, until arrived at Tamarin bay, 9 miles from Cape Brabant, the south-western extreme of the island; here the reef becomes narrow round the shore of the bay, which recedes about 5 cables from the general coastline, and has a similar width, with convenient depth of water for anchorage, but the holding ground is bad, and it is quite open to the westward. The Rempart and Tamarin streams discharge into the bay, and there is a small fishing village.

Plan 3087, Black river bay.

BLACK RIVER BAY (*Lat. 20° 22' S., Long. 57° 21' E.*) is an opening in the reef and recess between the spurs of the mountains $6\frac{1}{2}$ miles north-eastward of Cape Brabant; it has a village of about 600 inhabitants, mostly Indians, a battery in ruins, and a large and conspicuous martello tower on each entrance point. The bay is easily recognised from seaward by Mount Tamarin, on its northern side, and by the two towers. Mount Tamarin is 1,829 feet high, and slopes down to the shore of the bay, which is less than a mile from its summit. Reefs extend between 5 and 6 cables from both points of the bay, but there is an area, 3 cables wide, between them, with from 15 to 9 fathoms, sand, mud, and coral. All round the bay, the water is very shallow, and a line connecting the two martello towers marks the inner limit of a depth of 5 fathoms.

The Black river flows into the head of the bay; its shallow bar is subject to constant alterations during freshets in the rainy season, at which time the heat in this bay is almost unbearable and fever very rife.

Directions.—To enter the bay, having previously obtained *pratique* at Port Louis, if desirous of landing, a vessel has only to steer a mid-channel course between the reefs, which are easily seen, the Hermione spit on the starboard hand always breaking heavily,

General charts 2899, 748a.

Plan 3087, Black river bay. Var. 9° W.

and anchoring as convenient in from 14 or 15 fathoms to 6 or 7 fathoms, according to the class of vessel. The anchorage is fairly good, but with westerly winds a very heavy swell sets in, and is least felt rather towards the northern side. Vessels should, however, be always prepared to quit the anchorage at very short notice.

Tides.—It is high water, full and change, at Black river bay at 0h. 30m.; springs rise 3 feet, neaps 2 feet.

Communications.—A mail cart arrives from Petite Rivière, from which place telegrams can be sent, at 9-30 a.m., returning at 3-30 p.m. Carriages may be obtained by giving notice at the Post office at Black river bay the day before they are required. Petite Rivière is the nearest railway station, and is about $8\frac{1}{2}$ miles distant. Three good roads exist, the northern leading to Tamarin, Bambou, Petite Rivière, and Port Louis; the centre road also leads to Port Louis; and the southern road to Chemarel.

Supplies.—Beef can be obtained but not in large quantities. Vegetables of considerable variety are fairly plentiful. Eggs and poultry, scarce. Indian corn is the chief cultivation in the immediate neighbourhood, the situation not being adapted to the sugar cane.

Chart 711, Mauritius.

Little Black river bay, just southward of Black river bay, has a narrow entrance close along the southern side of Hermione spit, and runs 3 miles to the southward behind the barrier reef, with deep and smooth water for about half that distance, where one arm branches off eastward to the shore, the other continuing on southward; the reef there is 2 miles wide, and encloses some small islands, on which a temporary lazaret was once established; there are no villages on the shore of this bay.

The Barrier reef continues on to the southward, rounding Cape Brabant at a distance varying between 5 and $7\frac{1}{2}$ cables, and then continues eastward a farther distance of $13\frac{1}{2}$ miles to Port Souillac or Savane. There are only two narrow passes through it near the cape, viz., the Ambulante pass, about $1\frac{3}{4}$ miles northward of the cape, apparently fit at best of times only for a boat; and St. Jacques pass about one mile eastward of it; neither of these lead to any place but merely inside the barrier reef, where the depths have not been ascertained. Along the southern coast there are several breaks leading into bays, as presently described.

Cape Brabant (*Lat. 20° 28' S., Long. 57° 18' E.*) rises gradually from a low point at the S.W. extreme of Mauritius to the Morne, an isolated flat-topped hill, 1,809 feet above the sea, and only half a mile from it on its western side, but $1\frac{1}{4}$ miles from the extreme point; it

General charts 2899, 748a.

Chart 711, Mauritius. Var. 9° W.

forms an excellent landmark. Reefs extend round the cape, as already described; but opposite the bay on the south-eastern side the outer part of the reef is $1\frac{1}{2}$ miles from the shore. The bank of soundings extends $3\frac{1}{2}$ miles due West from the cape, coming to a point at that distance and quickly narrowing to one mile or less outside the reef in proceeding either northward or eastward. The depth varies from 7 or 8 fathoms near the edge of the reef to 20, 40, and 50 fathoms, and then suddenly to ocean depths.

Tidal streams.—The streams, during springs, run over the bank of soundings off Cape Brabant at from 3 to 5 knots, causing considerable ripples; the flood runs E.S.E. and the ebb W.N.W. along the southern shore, but immediately northward of the cape the streams follow the coastline, the flood running N.N.E. and ebb S.S.W. from 2 to 3 knots. The flood stream is said to commence about one hour after the moon rises.

SOUTH COAST.—Baie du Cap is a wide and clear opening in the reef opposite a mountain stream of the same name 4 miles south-eastward of Cape Brabant; fragments of coral rock are here heaped up by the sea to a height of 15 feet. The Bras de mer de St. Martin and Des Citronniers are little shallow inlets to which access is obtained by means of the Belle Ombre, another small opening in the reef, which at this part extends 7 cables off-shore; it is about $5\frac{1}{2}$ miles from Cape Brabant, and was formerly of some importance as a place for building small vessels. There is a beacon on the reef on the eastern side of the entrance to Belle Ombre. Jacotet bay, about 2 miles farther eastward, is an indentation in the land, with a corresponding opening in the reef; in the centre stands a triangular island which at one time was a stronghold of some insurgents; it is one of the places where the British, under Captain Willoughby, H.M.S. *Néréide*, effected a landing in 1810. The anchorage ground is bad.

Port Souillac, or Savane (*Lat. 20° 31' S., Long. 57° 31' E.*), is about 12 miles eastward of Cape Brabant; it has quays, a large church, and a courthouse; it is also a railway terminus, and was formerly a place of shipment, vessels of light draught conveying produce to Port Louis, but the deposit caused by the mountain stream Savane is filling up the creek.

There is a beacon on the reef on the eastern side of the entrance to Port Souillac.

Eastward of Souillac, over a space of 9 miles, to within 6 miles of the entrance to Grand Port, the coast is free from barrier reef, and there is moderately deep water close to the cliffs, which in some parts are over 100 feet high, but the coastline is broken by no less than seven small streams, all named, but of no consequence whatever.

General charts 2899, 748a.

Chart 711, Mauritius. Var. 9° W.

Towards the eastern termination of the cliffs and about 7 miles south-westward of the entrance of Grand Port, is the *Souffleur*, a natural curiosity, where a cave communicating with an inner passage forms a water-ram, which, when actuated by the waves, sends a jet of water to a great height.

Plans 1401 and 3048, Grand Port.

GRAND PORT (*Lat. 20° 23' S., Long. 57° 44' E.*), an anchorage of some extent on the south-eastern side of Mauritius, has the disadvantage of its three entrances being exposed to the full force of the S.E. trade wind and the consequent ocean swell. The port consists of a bay enclosed and sheltered by extensive coral reefs; from Grand river point, on the northern side, the shore reef extends 2 miles to the southward, and $1\frac{1}{2}$ miles off-shore to the eastward, the outer part being marked by the small rocky *Ile Roche*, on which stands a beacon 25 feet high and visible 5 miles, indicating the northern side of the North entrance.

At $1\frac{1}{4}$ miles S.S.W. from *Ile Roche* beacon commences the Great barrier reef, which partially overlaps the shore reef just before mentioned, and gradually curves to the S.W. for 6 miles, the greatest width being about 2 miles, and the distance of the outer central part from the nearest shore about 2 miles; the whole length is well marked at its outer side by a ridge from $1\frac{1}{4}$ to $2\frac{1}{2}$ cables wide, which uncovers at low water springs, and on which the sea almost always breaks very heavily; sometimes even when a short distance from the reef the sea presents the appearance of a flat calm. At $1\frac{1}{4}$ miles from the northern end, is the opening called Danish entrance. At $1\frac{3}{4}$ miles from the southern end are Marianne island, 21 feet above water, and two rocks called Bird island and Fous island, 14 and 20 feet respectively above water. At the south-eastern angle of the Great reef and only 7 cables from its south-western extreme is Fouquet island, on which stands the lighthouse. At 3 cables westward of it is Vaquoas island, 16 feet high, and immediately south-westward of the last-named, at the extreme S.W. end of the reef, is the historically famous little *Ile de la Passe*, 38 feet high, and covered with buildings and remains of batteries.

From the southern side of the bay, a similar reef with a high exterior barrier stretches $1\frac{3}{4}$ miles eastward, north-eastward, and northward from Aigrette island, and also along the northern front of the town of Mahébourg. The shore is everywhere rendered unapproachable, except to boats, by reefs and banks of various widths, and the apparently large sheet of water inside the barrier reef rarely affords a clear navigable space 5 cables in width.

General charts 711, 2899, 748a.

Plans 1401 and 3048, Grand Port. Var. 8° 50' W.

Aspect.—(See view on plans.) The Bambou range of mountains rises over the north-eastern part of Grant Port; from it spurs extend to the coast. The most conspicuous peaks on this range are: Grand Port mountain, near the southern extreme, which is the nearest, and attains a height of 1,586 feet, the outline including the mountain called Lion's head, 1,115 feet high, and 800 yards to the south-eastward, resembling a crouching lion; and Bambou peak, 2,041 feet high, 3 miles north-eastward of Grand Port mountain; the Thumb, a remarkable upright column of stone, 1,764 feet high, and only about 260 yards E. by S. from Bambou peak; when seen from the northward and eastward of Devil's point, this peak presents a good representation of Voltaire's profile. From this position also the Cat and Kitten peak, 1,552 feet high, shows most conspicuously.

At $3\frac{1}{4}$ miles E. by N. $\frac{1}{2}$ N. from the highest part of Grand Port mountain, a spur from the Bambou mountains terminates in a bluff, 328 feet high, having on its summit a remarkable black rock; the bluff bears the name of Devil's point, given it by the Dutch in consequence of the supposed magnetic disturbance in its vicinity.

Depths.—Off the South entrance, the 100-fathoms line lies about $1\frac{1}{2}$ miles from the edge of the reef, and the coast reef bounding Grand Port is bordered by a bank of irregular soundings extending some distance seaward; here the lead, if carefully tended, proves a tolerable guide in thick weather. Off the North entrance, the 100-fathoms line is farther out, 33 fathoms being found at about 2 miles outside the reefs, with a fairly regular decrease of depth up to that entrance, but shoaling very suddenly at the edge of the fringing shore reef.

The general depths inside the reefs in the long channel between the North and South entrance is from 15 to 9 or 10 fathoms when clear of the innumerable shoals and rocky heads; except off Devil's point, where shoals have almost closed the channel, but have still left a narrow 11-fathoms pass called the Narrows; and again at Jonchée bar, $1\frac{1}{2}$ miles north-eastward from the western extreme of the Great reef, where the channel is completely crossed by the bar, over which, for a space of 6 cables, only from 20 to 24 feet can be carried.

LIGHT (*Lat. 20° 23' S., Long. 57° 47' E.*).—From a dark grey coloured lighthouse, 84 feet high, with a red lantern, on Fouquet island, half a mile north-eastward of Ile de la Passe, is exhibited at 108 feet above high water a *fixed white* light, visible in clear weather from a distance of 16 miles. For arcs of visibility, see Light list and charts.

General charts 711, 2899, 748a.

Plan 3048, Grand Port, southern entrance, &c.

South entrance.—Buoys.*—The entrance to this channel lies between *Île de la Passe*, just now described, and *Laverdie spit*, the eastern extreme of the shoal ground extending from the mainland shore. Westward of *Île de la Passe*, the channel is 3 cables wide between the 5-fathom lines; but in the northern part, where the channel turns westward, it is less than 2 cables wide, and is there marked by two black buoys on the port hand and one red buoy on the starboard hand, as shown on the plan; the buoys are of mooring-buoy shape but without rings. The first on the port hand lies N. by W. distant $1\frac{1}{4}$ cables from *Pointe de la Passe*, the north-eastern extreme of the shore reef; this buoy is in $3\frac{1}{4}$ fathoms. The next buoy on the same side is off the *Olive bank*, and is moored in $3\frac{1}{2}$ fathoms, but vessels of deep draught should not approach it too closely, there being an 18-foot patch just beyond and outside it. The starboard hand buoy is in $3\frac{1}{4}$ fathoms, but, as in the other case, it should not be approached too closely. The depth in mid-channel in these narrows is from 24 to 26 fathoms.

Boat passage (*Lat. $20^{\circ} 24' S.$, Long. $57^{\circ} 45' E.$*).—There is a small break in the shore reef just outside *Pointe de la Passe*, between it and *Jacolet point*, through which boats can generally pass though the sea may be breaking heavily on the reef on either side of it. For vessels anchored on *Ananas bank*, this pass offers a useful means of communication with *Mahébourg* for boats of the whale-boat class or size, which can go to and fro over the shoal water inside the edge of the reef, keeping a good look-out to avoid coral heads, which are easily seen in the smooth water.

Plans 1401 and 3048.

Shoals.—Beacons.—The numerous shoals and coral heads are so clearly shown on the plan that a detailed description would be both confusing and useless. Many of them are marked by beacons; of these, the principal are the *Sappho*, *Petit Paté*, *Grand Paté*, *East* and *West Mât cassé*, *Ruff reef*, and others.

DIRECTIONS.—South entrance.—No pilots are to be obtained for either entrance to *Grand Port*. A vessel from the northward having *Flat island light* on a N.N.W. bearing should be careful, after sighting *Fouquet island light*, not to bring it on a more southerly bearing than S.W. by W. $\frac{1}{2}$ W. when at a distance of less than 8 miles, and, as it is approached, much more to the westward

* These buoys were not in position (1911). The reefs were shortly to be marked by beacons, of which due notice will be given.

Plans 1401 and 3048. Var. 8° 50' W.

and north-westward, until it bears about N.N.W., or she will be too near the barrier and coast reefs which form Grand Port. If approached from the southward, Fouquet island light or lighthouse should be kept westward of North until opposite the South entrance.

It is not prudent for vessels to attempt to enter Grand Port after dark; they should heave-to, head off-shore; and sailing vessels should keep well to the southward, as there is a constant set to the northward.

The forenoon is the best time for entering, as the shoal water may then be seen from aloft. As the sea sometimes breaks heavily within the 10-fathoms line, which extends about one mile eastward of Laverdie point, that line should not be crossed; an unmistakable clearing mark is the centre of Ile de la Passe in line with the summit of Grand Port mountain bearing N.W. $\frac{1}{4}$ N. until Fouquet lighthouse bears N. by E., when the vessel being near the centre of the channel and the island distant about 7 cables, the course will be W.N.W. for about half a mile, and the island passed by eye, keeping 3 cables from it on the southern side and 2 cables on the western side; from thence, a N. by E. course for about 4 cables will reach the Annanas bank if a temporary anchorage be desired; or the buoys and chart will be sufficient guide to the inner anchorages.

During, and for a time after, strong south-easterly winds, the sea is very high and breaks heavily in the entrance of the channel, notwithstanding the great depth of water, but after passing Ile de la Passe it subsides into a heavy swell in the channel, although still breaking heavily on the reefs. During the four months H.M.S. *Stork* was at the place in 1897, when careful observations as to the state of the sea were made and registered, the water, though often observed to be very rough outside, was very seldom breaking inside at all, and *never* to any height except on the reefs. The general character of the sea was such that at any time during that four months almost the smallest vessel could have safely entered.

Plan 1401, Grand Port.

Danish entrance (Lat. 20° 20' S., Long. 57° 50' E.), $5\frac{1}{2}$ miles north-eastward of the South entrance, has a depth of from $2\frac{1}{2}$ to 3 fathoms, with possibly a narrow central pass of 4 fathoms; but, generally, the sea breaks right across. This passage is not safe, and should not be used by vessels at any time. Even in the calmest weather, rollers sometimes come in without the least warning, and, unlike the South entrance, they not only break right across, but up the channel as far as the sand-cay on Flamand point.

General charts 711, 2899, 748a.

Plan 1401, Grand Port. Var. 8° 50' W.

NORTH ENTRANCE.—The entrance to this channel is one mile wide between Ile Roche and Great South point, the spit extending off the N.N.E. part of the off-lying southern reef, but the shoals northward of Great South point contract the navigable distance between the 5-fathoms lines to only about half a mile. Bambou peak bearing W. $\frac{3}{4}$ S. leads from the offing to this entrance, and the bluff of Devil's point a little open south-eastward of the easternmost small peak of Mont Rouge bearing S. 62° W. gives a good lead in the entrance. Ile Roche, easily recognised by its beacon, may be passed at 3 cables, and gradually brought to bear a little northward of N.E. $\frac{3}{4}$ N. by the time it is 7 or 8 cables distant, the opposite course being steered towards Diamant reef, awash at high water, and opposite the inner end of Danish entrance, until the rock on Devil's point bluff is nearly on with Grand Port mountain bearing W. by S. $\frac{3}{4}$ S., taking care to avoid Brisant point on the Great reef; after passing which, a S.W. course may be steered and anchorage taken up about 5 cables from the old battery on Devil's point, in 10 or 12 fathoms, mud; the rock on the bluff over the point bearing West. Diamant reef is easily seen, and nearly always breaks, even in the calmest weather. In fact, when once close to Ile Roche, the eye is the best guide for the channel, the edges of the reefs being very distinct with a good light.

The best anchorage, however, for a small vessel or for one of moderate size, especially if blowing hard, is found by rounding Tazar point, the south-western extreme of the northern reef, and marked by a fairly conspicuous beacon; the point should be rounded at about one cable, and the anchor let go in 5 or 6 fathoms 300 yards beyond the point, and rather nearer the reef than the shore, so that the vessel should ride in about mid-channel to the prevailing wind.

In this berth the water is quite smooth, and it is reported that a vessel entering with a very foul bottom and lying here for 3 or 4 days will leave perfectly clean.

Vessels drawing over 19 feet should not attempt to proceed through the narrow channels leading to Mahébourg; those of lighter draught should only do so when piloted by those who are accustomed to coral navigation and with a good light.

Plan 3048, Grand Port, southern entrance, &c.

Anchorage.—The first place in which a vessel will find shelter is on Annanas bank in Horse-shoe bight, or Baie Fer-a-cheval, in from 6 to 9 fathoms, sand and coral, 3 cables distant from Ile de la Passe, its western side bearing about S. by E., and the lighthouse on Fouquet island E.S.E. southerly. The eastern black buoy will then

General charts 711, 2899, 748a.

Plan 3048, Grand Port, southern entrance, &c. Var. 8° 50' W.

bear about W. by N. $\frac{1}{2}$ N. distant $5\frac{1}{2}$ cables, and the Cat and Kittens will be in line with the second summit of Mont Rouge N. $\frac{3}{4}$ E. This anchorage is about $3\frac{1}{2}$ miles in a direct line from the town.

The next and most frequented anchorage is about 2 miles farther in, northward of Petit Paté, in a clear space about $3\frac{1}{2}$ cables wide, with from 7 to 9 fathoms, mud. If the Petit Paté and Sappho reef beacons are in place and can be seen, they will be sufficient guides; or Marron hill open left of Mount St. Martin saddle, bearing N.W., is another mark; the western limit for the anchor should be with the Lions' head N. by E.

Other anchorages for large vessels are: In Hercules bay in from 8 to 12 fathoms; inside the bight eastward of Jonchée bar in 9 or 10 fathoms, a good roomy anchorage; eastward of Devil's point, with that point bearing about West, in from 10 to 14 fathoms; and for small vessels, southward of the Grand Paté, in from 6 to 8 fathoms; or, in the northern entrance, north-westward of the Tazar beacon, in from 4 to 6 fathoms, as described previously.

Tides.—Tidal streams.—It is high water, full and change, at Grand Port at Oh. 27m.; the time is, however, somewhat uncertain, the tides being much influenced by the wind; springs rise $2\frac{1}{2}$ feet, neaps $1\frac{1}{4}$ feet. With strong south-easterly winds the high-water stand sometimes lasts for several hours at and near Mahébourg.

In the South entrance the movement of the water is nearly always outwards, caused apparently by the water thrown over the reefs escaping by the channel. A flood tide may cause still water, and with the ebb tide and a strong trade wind the current may reach half a knot.

In the North entrance, both flood and ebb streams are fairly regular, and though never strong vary a good deal in strength.

Plan 1401, Grand Port.

Mahébourg, the principal town in Grand Port, so named after the celebrated French governor, Mahé de la Bourdonnais, stands on the eastern side of the River Chaux, in the south-western part of the port, enclosed by banks with shallow water, and about 5 miles distant by the best channel from the anchorage in Horseshoe bight. It used to be a military station, but was abandoned as such for the high and healthier atmosphere of Curepipe. It was almost useless as a mercantile port, sailing vessels finding the greatest difficulty in getting out against the prevailing trade wind; but the general use of steam-power, combined with the crowded state of Port Louis, may cause attention to be drawn to the great capabilities of Grand Port. Mahébourg and Grand river South-east are both in communication by rail-

General charts 711, 2899, 748a.

Plan 1401, Grand Port. Var. 8° 50' W.

way and telegraph with the whole island, the former being the terminus of the southern, the latter of the northern line.

Supplies.—All kinds of provisions are obtainable in the usual way, but water is scarce, of indifferent quality, and obtained only in small boats by casks. No vessel should take it on board unless compelled. Steamers should always condense water.

Landing.—The best landing is at the Race jetty, but if steam launches or other steamboats are used, a skiff or small boat of the whaler class should be taken in tow to effect a landing; all other boats drawing too much water except at the top of a high tide.

Chart 711, Mauritius.

COAST.—The whole of the north-eastern coast of Mauritius is bordered by a barrier reef, its outer edge varying from $2\frac{1}{2}$ miles to less than 3 cables from the coast, in which latter case it gradually loses its character as a barrier and becomes but a fringing reef. There are very few openings navigable even by boats.

Trou D'eau Douce is the first of these narrow gaps, $3\frac{1}{2}$ miles northward of Ile Roche and opposite Maho village; it is used by boats. Flacq passe, very dangerous to those unacquainted with it, is 6 miles farther northward; it is a mile from the nearest point of land, with a depth of one fathom; the reef encloses several bays of considerable size and a large space of water having from one to 3 fathoms; into these bays, several small rivers discharge, and are probably the means of maintaining the opening in the reef. Cargoes of sugar are taken from here by decked luggers; it is also a military station, and is on the line of railway leading round the northern end of the island from Grand river south-east.

Rivière du Rempart (*Lat. 20° 5' S., Long. 57° 42' E.*), 4 miles northward of Flacq, is a considerable stream flowing into a coral basin, which basin has from 4 to 7 fathoms over a large space, but not within half a mile of the village at the river's mouth, and deep water is still farther from the village Poudre d'Or, opposite a creek of the same basin, about 2 miles farther North. The barrier reef is at this part $2\frac{1}{2}$ miles from the coast, and there are three narrow and shallow openings, viz., Passe des Pirogues, Passe des Goelettes, and Passe des Citronniers; of these, the Passe des Citronniers is the best; it is $1\frac{1}{2}$ miles south-eastward of Amber island.

Amber island is a mass of rugged rock with two peaks, the eastern 85 and the western 65 feet high; the outward part projects $1\frac{1}{4}$ miles beyond the coastline, and the barrier reef is a mile still farther out, as well as surrounding it on all sides, but abreast of its

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Chart 711, Mauritius. Var. 8° 40' W.

south-eastern end is the small inlet called the Passe St. Gerant, and abreast of its north-western end is another, the Passe Latazar.

From the last-named Passe, the barrier reef curves gradually round for 6 miles north-westward to the Malheureux Passe, at the northern extreme of the island of Mauritius. During this 6 miles, there are at least six unimportant openings in the reef, only three of which are, however, named. They are the Passe D'Oscorne, Passe Vacoas, and Passe Reitz. The inner waters, though infested thickly by coral heads, are mostly navigable by boats, and on the coast are several villages and plantations.

Chart 1881, Cargados Carajos shoals. Var. 7° W.

CARGADOS CARAJOS SHOALS.—This extensive group of reefs, islets, and shoals is under the jurisdiction of Mauritius, and is universally known there as St. Brandon.

The principal or great reef is above water, extending from the south-western extreme in a curve to the North-east, North, and North-west; thus the concave side is turned westward, the North point bears from the S.W. extreme N.N.E., and is distant 26 miles, and the curvature of the eastern side from that chord is about 9 miles. The width of the reef varies from less than a mile near the southern end to $3\frac{1}{2}$ and $4\frac{1}{2}$ miles near the south-eastern and north-eastern parts; the bay on the western side of the reef is thickly studded with rocks and shoals; the eastern side has not been closely examined in consequence of the impossibility of approaching its eastward face from seaward. The outline was sketched in by Lieut. Mudge, R.N., in 1825, by means of boats penetrating amongst the reefs from the western side.

Several small islands and rocks stand on the reef; others are detached off the northern and western sides. Of the former, there are two unnamed islets covered with low bushes, on the north extreme. At one mile from the north end there is a small islet called Ile Raphael (*Lat. 16° 25' S., Long. 59° 33' E.*), on which there is a permanent settlement of fishermen from Mauritius, 28 in number, including the white managers, engaged all the year round in catching and drying fish, of which there is a great quantity in the vicinity. There are several houses and sheds on the island, and a large cement tank for catching rainwater, of which there is never any scarcity. No wells exist. Several casuarina and cocoanut trees were planted in 1897 and are flourishing. The islet is visible from a distance of about 10 miles from the deck of a vessel.

There is also a fishing establishment of 40 men permanently living on Avocare island, and Pearl and Frigate islands are inhabited from time to time by guano diggers.

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Chart 1881, Cargados Carajos shoals. Var. 7° W.

These establishments all belong to one company in Mauritius, and are visited by a schooner once a month.

Mapare and Avocare have trees growing on them, and are visible from 8 to 10 miles; the former can only be reached by pirogues over the reef; the latter is approachable by small vessels with local knowledge, but it is represented, on account of coral heads and other dangers, as being very difficult of access.

Coco island had, in 1905, four cocoanut trees growing on it, and is visible for about 10 miles. When first seen from the southward it resembles a three-masted vessel under sail.

The remaining islands of the group are none of them more than 8 to 10 feet in height; the larger are covered with low shrubs and creepers, having the appearance of grass. The others are mere sand-banks; they are visited in August for breeding purposes by enormous numbers of sea birds, and their eggs, which lie on the ground in thousands, are excellent eating.

Albatross island is the most northern of the group, and lies 10 miles N. $\frac{1}{2}$ E. from the northern end of the bank; the *Samarang* could not effect a landing on it in 1846.

North island is $2\frac{1}{2}$ miles N.E. from the islands on the northern end of the reef: landing on it is not practicable; there is a large $1\frac{1}{2}$ -fathoms patch a mile to the southward, and breakers have been seen 2 miles north-eastward of it. Also, a dangerous shoal was found by Baron Roussin 3 miles W. by N. $\frac{1}{2}$ N. from the northern islet of the reef.

Siren island lies S.W. $\frac{1}{2}$ W. distant 2 miles from Ile Raphael, and has from 8 to 12 fathoms between it and the reef. Pearl island is $8\frac{1}{2}$ miles in the same direction and 7 miles westward of the great reef; it has depths of from 20 to 30 fathoms around it at 5 or 6 cables from its shore. There are three or four houses and a rough pier on the island. The Pearl reef, on which the sea breaks, lies $2\frac{1}{2}$ miles north-eastward of Pearl island.

Frigate island is 3 miles southward of Pearl island; it has from 10 to 20 fathoms around it, 5 or 6 cables distant, and on it landing can be effected; this island has two small huts on it, and swarms with rats.

Baleine rocks lie 5 miles southward of Frigate island and $3\frac{1}{2}$ miles from the nearest part of the great reef; they are surrounded at about 5 cables by depths of 15 or 16 fathoms, but the rocks themselves are awash at low water.

Verronge islet (*Lat. 16° 39' S., Long. 59° 33' E.*) is 10 miles north-eastward from Coco island, at the southern end of the group,

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Chart 1881, Cargados Carajos shoals. Var. 7° W.

and 2 miles from the great reef; it lies well in the bight of the great reef, and is surrounded by depths of from 3 to 7 fathoms, but with many shoal coral heads interspersed; this island also is used as a fishing station.

Soundings.—A depth of 32 fathoms is found at 16 miles westward of the main reef, and on the northern side the bank apparently joins the Nazareth bank, presently described. Between Albatross and North islands are depths of from 10 to 15 fathoms, but the eastern side of the group, in addition to the tremendous sea always breaking over it, is said to be steep-to, and therefore most dangerous to approach under any circumstances.

Directions.—Cargados Carajos islets should not be approached by night; but, during daylight, in clear weather, they may be seen from a distance of 8 to 10 miles. A vessel approaching from the southward and intending to anchor off them should steer direct for the main reef, the south-western extreme of which may be rounded at a distance of one mile. Vessels approaching from the northward are recommended to make Albatross island.

Anchorage.—Vessels can anchor in the bight north-eastward of Coco island at from 2 to 4 miles from that island, and about a mile from the reef, in not less than 11 fathoms, sandy bottom. Between Ile Raphael and Siren island the soundings only vary from 10 to 13 fathoms, and 6 fathoms are found within 2 cables of the reef; vessels may therefore anchor about 3 cables westward of Ile Raphael, or at a similar distance E.N.E. from Siren island.

The anchorage westward of Verronge islet is not recommended, as that part is shoal and rocky.

There is said to be a good port for small vessels on the north-eastern side of the great reef, but the entrance, if there be one, must at all times be difficult for a sailing vessel, and unapproachable even by a steam vessel when the South-east trade is blowing steadily.

Tides.—It is high water, full and change, at Cargados Carajos, at 2h. 0m.; springs rise about 4 feet.

Tidal streams.—In the anchorage off Ile Raphael the tidal streams in both directions are felt somewhat strongly, but chiefly that running to the northward. Off Frigate island they are very slight, the southerly set alone being distinguished. In the anchorage off Coco island the tidal stream runs to the northward at the rate of about half a knot when the tide is rising. The stream to the southward is barely perceptible.

In the month of August a strong current, setting westward, was experienced off the southern side of the group.

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Chart 1881, Cargados Carajos shoals. Var. 7° W.

Water.—Rain water, of which there is no lack throughout the year, is caught in tanks on the inhabited islands.

Chart 2899, Chagos archipelago to Madagascar. Var. 6° W.

NAZARETH BANK.—This extensive bank of soundings may be considered to extend from the bank northward of Cargados Carajos for about 200 miles in a N.E. by N. direction, terminating in about lat. 13° 20' S., long. 61° 10' E. The width varies from 30 to nearly 100 miles. This bank is frequently crossed by vessels, and the least known depth of 14 fathoms is near the eastern extreme in lat. 14° 30' S., long. 61° 28' E. At about 50 miles W. $\frac{1}{2}$ S. from this the depth is 15 fathoms; nothing deeper than 20 fathoms has been found between these two positions, and this extensive flat extends about the same distance to the northward. The limits of the bank are clearly indicated by the change in colour of the water.

Current.—The deep water channel between Nazareth bank and Saya de Malha is about 100 miles wide, and a westerly current has been known to set through it at from 25 to 50 miles a day. Between the shoalest part of Nazareth bank and Cargados Carajos, the current also runs strongly westward throughout the year.

Chart 715, Rodriguez island. Var. 8° 10' W.

RODRIGUEZ ISLAND.—**General description.**—Rodriguez island, formerly called Diego Rais, lies about 320 miles eastward of Mauritius. It is 10 miles long, East and West, 4 miles wide, has an area of 70 or 80 square miles, and is visible in clear weather at a distance of 35 or 40 miles.

The island is of volcanic formation, composed principally of basalt, with a little upraised coral at each end; it is hilly throughout, with but little level land. A central ridge 1,300 feet high at its culminating point, Mount Limon, divides the island longitudinally from the East extreme for the greater part of its length, and from this ridge, spurs, separated by deep ravines, extend to the northern and southern shores. The western portion of the island is rather more broken into isolated hills, and is lower than the eastern portion.

Population.—The population of Rodriguez increases; in 1881, it was only 1,478; in 1909, it was 4,386, mostly all of African descent, who are mainly fishermen or small cultivators.

Rodriguez is an important station of the Eastern Telegraph Company, and a large staff of employés is maintained for the service of the submarine cable.

There are several houses scattered about in the interior and in the bays around the island; but only the small town of Port Mathurin on the northern side of the island, and the hamlet of Gabrielle, near the

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Chart 715, Rodriguez island. Var. 8° 10' W.

centre, can rank even as villages. There are no regular roads, and the paths are bad with the exception of that to Gabrielle.

Of natural curiosities, there are some perfect basaltic columns, 190 feet high, in the Baie aux Huitres valley, the next valley westward from Port Mathurin; and numerous caverns in the coralline limestone on the western and south-western sides; some of the latter are very large, one being nearly a mile in length, having in them beautiful transparent stalactites and wells of good fresh water.

Except during the dry season, there is no lack of streams in the valleys, some of them, however, are charged with mineral, and their waters are not fit to drink. There is a waterfall in the upper part of the valleys Soupir and Cascade, near Mathurin village.

Products.—There is but little cultivation, fishing is the principal industry, though stock raising is done on a small scale; a considerable quantity of vegetables are grown, also some tobacco.

Trade, Police, &c.—The following articles are exported, chiefly to Mauritius: Cattle, salt fish, goats, and poultry; the value of the exports in 1906 was Rs. 1,99,375, and of the imports Rs. 1,72,660. The island is a dependency of Mauritius administered by a magistrate, who practically governs the island; there is a Government medical officer and two clergymen, one Church of England and one Roman Catholic; also a small force of police. There are two Government schools, with a total of 268 boys and girls on the roll, and two Roman Catholic churches, nearly the whole population belonging to that church, also a public hospital at Mount Lubin. The hospital, schools, and churches are maintained at Government expense. In 1908 the revenue was Rs. 12,989 and the expenditure Rs. 26,728. The revenue is mainly derived from direct taxation, such as licences, lease of Crown lands, &c.

Communications.—By means of the telegraph cable, completed in 1901, Rodriguez is in communication by wire with the telegraph system of the world (*see* page 25); the telegraph office is always open. As regards shipping, the case is reversed. The island is occasionally visited by one of His Majesty's ships, but no mail steamers call, and the only regular communication is with Mauritius, and is performed by sailing vessels under a contract with the Government of that island, which pays a subsidy for five trips in the year, but the vessel does not run during the cyclone season.

Winds.—Cyclones, &c.—The S.E. trade wind is more or less continuous at Rodriguez all the year round. From June to October inclusive is the season of most settled weather, the wind blowing from between East and S.E. with a force of from 3 to 6, but generally fresh. Cyclones are said to visit Rodriguez a month earlier, and to occur more

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Chart 715, Rodriguez island. Var. 8° 10' W.

frequently, than at Mauritius, but the latter statement is not well authenticated. The cyclone of April, 1886, was the first that had visited the island for ten years. The centre passed a few miles northward of the island and curved southward and westward across the track of the homeward-bound vessels from India and China; several of these, notably the *Lord of the Isles* and the *Runneimede*, having mistaken the signs, ran into the centre of the cyclone, and suffered much damage. At Mauritius, it was only felt as a fresh gale. In 1896 there were two cyclones, one in January, when the barometer fell to 28·574 at the police station at Port Mathurin, height above the sea 10 feet; and the other in February; the first was very severe and destructive to plantations. There was a very severe one in May, 1907. The cable between Rodriguez and Mauritius has been found to be most useful in the study of the meteorology of these regions, and observations are cabled daily from Mauritius observatory.

From November to May cyclones may be experienced, and the weather during these months is always unsteady; the wind sometimes drawing round to the northward as far as N.E. by E., and remaining there for some days together. Calms also occur at this season, but not often; neither are they of long duration.

Climate.—Rains prevail from December to April; they are heaviest in January, but are not continuous. The island is comparatively cool, the temperature being lower than at Mauritius, but the breeze stronger; it is remarkably healthy, though it suffered severely from drought after the cyclone in 1886. The coolest weather is in July and August, the hottest in the latter part of January, and February. The average temperature, as taken during four years indoors at Port Mathurin police station at these seasons, is as follows:—Maximum, in rainy season 88·8; minimum, during fine season, 60·2. The highest and lowest pressure of the barometer corresponds with the lowest and highest temperatures; thus, excluding cyclonic disturbances, the average highest recorded pressure is in the fine season and is 30·46 inches, when the temperature is 60·2; and the lowest pressure is 29·65 inches, when the temperature is 88·2; see also Meteorological table in Appendix. Rheumatism prevails to a considerable extent, but the principal causes of death are dysentery, bronchitis, influenza, and old age.

SOUNDINGS.—A bank having depths of from 20 to 40 fathoms, coral and sand, extends from the reef on the northern side of the island for 3½ miles; on the East, 6 miles; on the South, 2 miles; and, on the West, 12 miles. The bank is steep to all around, and falls suddenly into 200 fathoms and ocean depths.

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Chart 715, Rodriguez island. Var. 8° 10' W.

Fringing reef.—An extensive flat fringing coral reef encircles Rodriguez island, varying much as to the distance it extends from the coast. At the south-eastern point of the island it is only 20 yards wide; from the western end it extends $4\frac{1}{2}$ miles in a southerly, $2\frac{1}{2}$ miles in a westerly, and 4 miles in a northerly direction. Its position is indicated by breakers, even in the calmest weather. The outer edge is tolerably steep-to, except in a few places, but, with the swell that generally rolls in, the sea often breaks in 10 fathoms several hundred yards outside the actual shoal water. In light winds a vessel can anchor almost anywhere outside the reef in from 10 to 20 fathoms.

The surface of the reef is level, and, at low water, springs, the major portion is dry, whilst some parts are covered by a foot or two of water, leaving a few shallow canoe channels.

There are several narrow openings or passes from the sea through the reef at different points, and a shallow channel exists near the shore nearly all round the island; these passages are used by fishermen, to and from the deep water fishing-grounds, and by means of the inner channel communication is kept up by canoes between all parts of the island. They are, as a rule, too shallow for ships' boats except at high water. The inlets through the outer edge of the reefs might be of great value to the crews of wrecked vessels if known: When rollers set in they are, however, impassable. At Quatre-Vingt Brisans, the south-western corner of the encircling reef, the edge is altogether broken up into detached patches; on this part the breakers are heaviest, and here there have been several wrecks.

Islets.—On the western part of the fringing reef are many islets. Of these:—Crab islet, 150 feet high, Catherine, Frigate, and the neighbouring islets are all high and basaltic. Cocoa and Sandy islands, farther north-westward and nearer the outer edge of the reef, are mere sand cays about 15 feet high and covered with low scrub. Booby and Diamond islands, westward of Mathurin bay, are 55 and 60 feet high respectively, and are basaltic. Other islets on the south-eastern side are mentioned in connection with Port South-east.

Plan of Port South-east on 715.

PORT SOUTH-EAST (*Lat. 19° 45' S., Long. 63° 28' E.*).—**Grande Passe.**—This large pass on the south-eastern side of the island leads into Port South-east. The entrance, at a distance of $1\frac{1}{2}$ miles from the shore, is about 200 yards wide; a few hundred yards outside it is a bar with depths of from 4 to 6 fathoms, with a very narrow 10-fathoms channel through its centre; on this bar the sea breaks when rollers set in.

Inside the bar the water is deep, but a rock on the eastern side rather narrows the entrance and throws a roller across occasionally.

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Plan of Port South-east on 715. Var. 8° 10' W.

The pass itself is 130 yards wide, the general direction of the channel North, and it is $1\frac{1}{4}$ miles in length, from 10 to 20 fathoms deep, and clear of rocks throughout; but the strong tides, the sinuous nature of the channel, and the ordinary strength of the wind, render it unadvisable for any stranger to attempt it unless in an emergency. At the inner end, it turns abruptly westward, the harbour lying parallel with the coast of the island.

No marks can be given for the entrance, but it may be clearly seen from aloft at a distance of one or 2 miles.

Port South-east is available for vessels drawing 20 feet as far as depth is concerned. It is well sheltered, being protected by the reef, and has a clear triangular space eastward of Hermitage islet about 4 cables long on each side, with depths of from $3\frac{1}{4}$ to 10 fathoms, and good holding ground of mud and sand; it would be a useful anchorage but for the difficulty of ingress and egress, the latter especially affecting a sailing vessel.

Islets.—Hermitage islet is a rock about 2 cables in length and 85 feet high, surrounded by a fringing reef and standing in the centre of the harbour. There are several low coral islands on the reef south-westward of the harbour, viz., Misel islet; Gombrani island, 20 feet high, on which are a few huts; Pierrot island, 20 feet high, also with a few huts, and a palm tree; and Flat islet, 10 feet high, near the outer edge of the reef. The Passe Platte is an opening and shallow pass through the reef leading past all these islands into the western end of Port South-East; this entrance is $1\frac{3}{4}$ miles south-westward from the Grande Passe, and it is not available for anything but native fishing-boats.

Chart 715, Rodriguez island.

COAST.—There are several deep bays in the southern, western, and northern coasts of Rodriguez island, some with deep water inside; but as the reef blocks their entrances, they are useless for anchorage.

Plan of Mathurin bay on 715.

MATHURIN BAY (Lat. $19^{\circ} 40' S.$, Long. $63^{\circ} 26' E.$) is the sole practicable harbour suitable for vessels of the deepest draught; it lies on the northern side of Rodriguez island, and is an excellent anchorage formed by a semicircular inward curve in the edge of the reef. It is easy of access; the bottom is even and the holding ground good, being sand and mud. To seaward, the bay is protected by the Middle ground, which stretches across the entrance, leaving channels eastward and westward of it, but as the wind during the greater part of the year is from the S.E., the island itself prevents the swell from being felt to any great extent. There is room for a large number of

General charts 2899, 748a.

Plan of Mathurin bay on 715. Var. 8° 10' W.

vessels to lie at anchor in Mathurin bay, and it was at this anchorage that was assembled, in 1810, the large force, consisting of about 70 sail of men-of-war and transports, destined for the reduction of Mauritius.

Depths.—There is a least depth of 4 fathoms in the eastern pass, 10 fathoms in the western pass, and 10 fathoms at the anchorage.

The Middle ground is a large coral bank with general depths of from 5 to 8 fathoms, and a number of small patches of from one to 3 fathoms. The bank does not generally show, and except during the rollers, the sea never breaks on it. It is about $7\frac{1}{2}$ cables in length W.N.W. and E.S.E., though, but for the narrow Eastern pass, it might be considered as joined to the eastern shore reef, so numerous are the shallow patches in that channel.

Entrances.—**The Eastern pass** is narrow and somewhat intricate, leading between coral heads which cannot always be seen; but a sailing vessel should always enter by this pass, as the wind is usually too much from the southward to admit of her fetching in through the other; and although it is not impossible for a vessel to work in through the Western pass, a stranger would run more risk by doing so than by taking the Eastern pass with a leading wind.

To enter by the Eastern pass, bring Diamond island in line with a notch in the hills at the western end of Rodriguez island bearing S.W. by W. $\frac{1}{4}$ W. (*see view B on plan*), and run in on that line, following the leading mark closely, until Le Piton comes in line with a whitewashed cliff bearing S. $\frac{3}{4}$ W., when a vessel will be inside the reefs, and may alter course to about S.S.W. $\frac{1}{4}$ W. towards the houses of Port Mathurin; this course leads in not less than $4\frac{1}{2}$ fathoms, though very near to 4 fathoms on each side, and some patches of $1\frac{1}{2}$ and 2 fathoms not far distant. The whitewash mark is one-third from the eastern end of the most prominent and blackest cliff on the coast. Should it not be well kept, the cliff itself is a good mark, and can easily be recognised when on the bearing indicated.

Le Piton shows as a rounded cone, and is quite unmistakable when near Mathurin bay, but when seen from the eastward or westward it loses its conical shape.

The Western pass (*Lat. 19° 39' S., Long. 63° 25' E.*) is recommended for steam vessels, and for sailing vessels going out, being wide and straight; the only danger to a large vessel is a 3-fathoms patch, which must be left to the westward.

A steam vessel approaching Mathurin bay from the westward should keep Pointe du Sel open of Pointe Corne until Le Piton is in line with the flagstaff at Port Mathurin bearing S. $\frac{3}{4}$ E. (*see view A on chart*); steer in on that line until Booby island bears W. by S,

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Plan of Mathurin bay on 715. Var. 8° 10' W.

then alter course to S.E. for the anchorage; nothing less than 10 fathoms will be found on this track.

Leaving Mathurin bay, steer N.W. by W. until Le Piton is in line with the flagstaff; run out on that line until Pointe du Sel opens off Pointe Corne; a vessel will then be clear of the reefs, and can keep away to the westward; but if bound eastward, in order to clear the Middle ground, keep Le Piton in line with the flagstaff until Booby island bears W. by S. $\frac{1}{2}$ S.

The leading mark, Le Piton, in line with flagstaff, is reported to be very bad when in the pass.

Pilot.—A pilot for Port Mathurin will go off to a vessel on the usual signal being made.

Anchorage.—The most convenient anchorage in Mathurin bay is nearly a mile from the town, and 2 or 3 cables off the entrance to the creek, in 10 fathoms, sand and mud, with Le Piton in line with the cliff of Point Venus bearing S. $\frac{1}{4}$ W., and Point Manioc, the extreme of land to the westward, showing inside Diamond island and bearing about W.S.W.

The creek runs in through the coral reef towards the settlement, taking at first a W.S.W. direction for about 4 cables, with a depth decreasing from 8 or 10 fathoms to 5 fathoms, and a width of about 150 yards. It then turns to about S. by W. $\frac{1}{2}$ W. and immediately becomes very narrow with only a small boat channel. It affords good berths for the small schooners that carry on the trade of the island. These vessels place their anchors on the coral, well up the creek, and moor head and stern.

Tides and current.—It is high water, full and change, at Port Mathurin, at 0h. 30m.; springs rise 5 feet, neaps $3\frac{1}{4}$ feet. The tidal streams are not appreciable except in the channels and passes. A tolerably constant current sets westward past the island during the trade wind, at from 5 to 15 miles a day.

Rollers.—Occasionally rollers set in; they cause a swell in Mathurin bay and heavy breakers on all shoal places. They come from all quarters and generally last only a few hours.

Landing.—There is a small pier off the town of Port Mathurin and a narrow boat channel leading to it in the upper end of the creek. The boat channel can be used by small boats (galleys and whalers) at all times of the tide, but they must hug the posts which mark the channel, as a few yards away from the channel it is very shallow, with many detached pieces of coral lying about; if wading is resorted to, shoes should, however, be worn, as there is a small sluggish fish called the *Laff*, which lies in the mud, and a wound from its poisonous spine is said to be dangerous.

Plan of Mathurin bay on 715. Var. 8° 10' W.

Port Mathurin, the principal settlement on Rodriguez island, is a small town standing by the seashore on a flat sandbank opposite the two valleys, Soupir and Cascade, and is nearly surrounded by water at high tide. The house of the magistrate and the police station are close to the landing-place. The flagstaff, used as a leading mark, is close to the beach, and the Union Jack is hoisted when a vessel is in sight.

Point Venus, a clifly headland on the southern side of Mathurin bay, and nearly half a mile eastward of the settlement, is in lat. 19° 40' 23" S., long. 63° 26' 15" E. A stone hut, used by the party who observed the transit of Venus on December 9th, 1874, marks the point, and the Telegraph Company have also erected a flagstaff there.

The Eastern Telegraph Company's quarters are on Point Venus; these consist of three large corrugated iron buildings and the flagstaff before mentioned, all facing the anchorage, and very conspicuous from seaward. A small boat pier has been built at Point Venus with a flagstaff at the end of it, but boats can only get alongside at high water.

Supplies.—Water can be obtained from Cascade river, eastward of the houses; but it is very difficult to procure, as the reef only permits boats to get in at high tide, and to get good water the casks must be taken some distance inland. Beef, fish, fruit, and vegetables are all plentiful.

Chart 2899, Chagos archipelago to Madagascar.

BANK.—About 90 miles W. by N. $\frac{1}{2}$ N. from Rodriguez is a coral bank of considerable extent, on which the least water found is 35 fathoms; but there may be less, as for 15 miles around it the bottom is most irregular, depths of from 200 to 400 fathoms being found in close proximity to those of from 1,000 to 2,000 fathoms.

The general depths between Rodriguez and Mauritius westward of the bank described are over 2,000 fathoms, but eastward of Rodriguez for over 300 miles on the line of the cable to Cocos island, the depths, though gradually increasing eastward, only vary between 1,300 and 1,900 fathoms.

General charts 2899, 748a.

CHAPTER IV.

LA RÉUNION.

(*Lat. 20° 50' S. to Lat. 21° 25' S.*)
 (*Long. 55° 10' E. to Long. 55° 55' E.*)

VARIATION IN 1911.—Decreasing 4' annually.

Chart 1497, Réunion island. Var. 9° 30' W.

RÉUNION.—General description.—The island of Réunion, a French possession, lies 95 miles W. by S. from Mauritius and about 370 miles S.E. $\frac{3}{4}$ E. from Tamatave, one of the nearest ports in Madagascar. It was discovered by the Portuguese navigator, Dom Pedro Mascarenhas, about the year 1507; it was then uninhabited by either man or beast. The name of that commander was applied to this and the two adjacent islands until 1649, when De Flacourt took possession in the name of the French king under the appellation of *Ile Bourbon*. The first colony was established in 1664 under the French East India Company, at the bay of St. Paul; after a century in the hands of the company it reverted to the French Government in 1764. During the revolutionary period, the island was allowed to govern itself under the name of *La Réunion*. It was taken by the English in 1810, but restored to the French in 1815 under the name of *Ile Bourbon*, which it retained until 1848, when it again resumed the name of *La Réunion*, and at the same time the abolition of slavery was proclaimed.

The coastline of the island is roughly in the shape of an egg, the greatest diameter being 39 miles N.W. and S.E., and the width 28 miles. It is entirely of volcanic formation; many extinct craters are to be seen, but the *Pic du Volcan*, *Fournaise*, or *Grand Brûlé*, 8,613 feet above the sea, is still an active volcano. It generally burns without violent eruption or noise, though sometimes during the rainy season it is very active; it frequently emits ashes, but the last flow of lava was in 1860; slight shocks of earthquake are frequent. The island is very mountainous; from a vast mass near the centre rises the *Piton des Neiges*, 10,069 feet above the level of the sea, and generally tipped with snow for a short time in every winter season.

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Chart 1497, Réunion island. Var. 9° 30' W.

At $3\frac{1}{2}$ miles farther westward is the Grand Bénard, 9,495 feet high, and $2\frac{1}{2}$ miles S.S.W. from it is the Petit Bénard, 8,059 feet in height; between those three great peaks the Petites Salazes present three needle points, 7,500 feet above the sea, and 4 or 5 miles to the northward is the gigantic cone, Pic Cimandef, 7,303 feet high. Between the mountain mass, of which the Piton des Neiges is the highest point, and the great volcano near the south-eastern end of the island, there extends a level plain called Cafres or the Plaine des Sables, 5,250 feet above the sea. This line continued to Pointe des Galets forms an imaginary division of the island into two parts; that to the northward is called the *windward side* and that to the southward the *leeward side*, but without due reason, as the prevailing wind is from the South-east.

The summits of the higher mountains are covered with moss; lower down will be found reeds and coarse grass until the height above the sea is reduced to 5,000 or 4,500 feet, where the forest zone commences. Trees formerly grew luxuriantly from this limit to the water's edge, covering extensive plains and valleys, and among them were many descriptions of wood of great value to the builder and cabinet-maker. To clear the ground and for other purposes, the trees have been destroyed to such an extent as to disadvantageously affect the climate, and an effort is now being made to replant under Government supervision, money being voted and laws made for the preservation of forests. All the lower parts of the island, amounting to about two-thirds of the whole, are cultivated; a large space at the south-eastern end, where lava has poured into the sea, presents the appearance of black waves devoid of vegetation, except a few lichens and casuarina trees in the crevices. On some parts of the coast the sand and gravel thrown up by the sea form retaining banks, behind which are ponds, but in most places the coast rises abruptly from the sea, with deep water close-to.

The island is singularly gifted in richness of soil, and, from its great altitude, in variety of climate. All tropical as well as European fruits and vegetables may be successfully grown; it is only necessary to choose a position suitable to the produce required; thus—on the East coast is a hot damp tropical climate, and on the West coast a hot dry climate. On the eastern hills is a cool damp climate, and on the western hills it is cool and dry. The means of communication, both by road and railway, are also good and favourable to agricultural pursuits.

A few rivers and rivulets water the island; the principal are the Galets, St. Etienne, du Mat, and Ste. Suzanne, which take their rise in the mountains; none of these streams are navigable except the last, which allows small vessels to ascend about half a mile; they are all

General charts 2899, 748a.

Chart 1497, Réunion island. Var. 9° 30' W.

impetuous torrents during heavy rains, but, with many other water-courses, are dried up or nearly so during the fine season. Canals have been cut for irrigation purposes, and proposals made to dam up certain torrents to form reservoirs for use in the dry season. There are three hot mineral springs:—At Salazie, 2,870 feet, and at Cilaos, 3,600 feet above the sea; the waters are ferruginous, and contain carbonate of soda at a temperature of from 88° to 100°. At Mafate the water is sulphurous and alkaline at an altitude of 2,230 feet, and the temperature 88°. Though the springs at Salazie may not be the most efficacious, they are the most frequented, in consequence of the facility of access and the accommodation provided; the Government also have established a branch of the military hospital there.

Sulphur has been found and some of it brought into use; there is also limestone and some minerals; the latter are principally found near the centre of the island.

Government.—There is a Governor and a Conseil-Général, the latter elected by the inhabitants, and the colony returns one senator and two deputies to the Legislature in Paris.

Ports and landing piers.—With the exception of the artificial port of Des Galets, there is no harbour in the colony which a seagoing vessel can enter. All merchant vessels from abroad must call at St. Pierre, St. Paul, Port des Galets, or St. Denis, where permits are granted to visit the remainder of the coast; and they must take their departure or clearance from one of those four places, where alone there are Custom's establishments. At other places round the island Marine establishments have been formed by private enterprise with all necessary appliances for loading and unloading vessels; there are 18 or more such places. The jetties consist of wooden platforms resting on piles or suspended by sheers, well above the reach of the sea, and projecting at right angles from the shore to a depth of 10 or 13 feet, having a crane at the outer end, where goods are landed by specially built boats; and pertaining to each jetty are store-houses for the reception of merchandise.

As the greatest amount of shipping work is done during the bad weather season, sailing vessels have frequently been occupied from 65 to 80 days in unloading and loading; the dues charged are, however, only about half those in force at Port des Galets, where by far the greater portion of the trade of the island is now transacted. Of these Marine establishments in open roadsteads, those on the northern side of the island are safest, as the prevailing wind blows on-shore at the south-eastern side, where also the holding ground is decidedly bad. Early in December, vessels must take up off-shore berths, and between November and April should put to sea on the first appearance of bad weather.

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Chart 1497, Réunion island. Var. 9° 30' W.

The regulations for entering the harbours of French possessions in time of war will be found in Appendix V.

British Consulate.—There is a British Consul and a Vice-Consul at St. Denis.

Population, &c.—The population of Réunion in 1907 was 177,677, of whom 164,597 are returned as French citizens, the remainder being classed as Indians, Malagasies, Kaffirs, Chinese, and Arabs. Of the French citizens, it can be safely said that 85 per cent. are coloured people. Native labour, in 1909, was sufficient for all ordinary purposes, except at harvest time, but it is doubtful whether the area of land under cultivation could be extended without imported labour. Military service is now compulsory in the island, and will probably tend to improve the class of young men temporarily withdrawn from their ordinary occupations. The language in common use is a French patois.

Currency, &c.—The currency of Réunion consists of local bank-notes and token coinage. It is nominally the same as France, francs and centimes, 25 francs = £1.

The metric system of weights and measures is in force; one kilo = 2·2lbs. (avoir.); 1 litre = 1·76 pints.

Time.—Réunion keeps time of the 60th meridian East, or 4 hours fast of Greenwich mean time.

Winds.—From April to November, the trade wind blows continuously, varying between E.S.E. and S.S.E., freshening generally about 9h. a.m., falling lighter about 4h. p.m., and dying away to a calm, or nearly so, during the night; if it does not die away at night it generally blows very fresh on the following day. If, during the day, the breeze is unusually light and dies away earlier than usual, a light land breeze may be expected during the night. The south-easterly winds are at their greatest strength during June, July, and August. In the bad weather season, from November to March, south-easterly winds are still the most common, but they are more moderate in strength, and are subject to interruption by winds from West and North-west, and by calms. This is also the season when cyclones and heavy gusts may be expected, which in their turn are generally followed by a calm or by a westerly wind of short duration, to be succeeded by the prevailing south-easterly wind.

The S.E. trade wind naturally first strikes the south-eastern part of the island in the neighbourhood of St. Phillippe. The obstruction caused by the high mountain mass fronting it, divides the aerial current, causing one branch to pass along the weather coast as far as St. Denis, where it passes away from the land to the north-westward; the other branch following the south-western or lee coast as far as the vicinity of Cape des Chameaux, then, similarly, turns off to seaward;

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Chart 1497, Réunion island. Var. 9° 30' W.

the result being that from Pointe des Aigrettes to Cape Bernard, including St. Paul bay and Port des Galets, only light eddy breezes prevail during the trade wind season, and that coast is, therefore, well sheltered during the summer months. Again, during the winter season, November to March, cyclones generally strike Réunion, coming from the eastward, about Ste. Rose; and, in their progress, Pointe des Galets receives the shock under the most favourable circumstances, for, if that point be within the limits of the dangerous semicircle, the wind can only reach it after passing the natural screen formed by the lofty mountains of the interior. It therefore follows that during the whole year this north-western coast is the most sheltered part of the island. It may be useful here to give some local experiences of cyclonic disturbances, but for detailed information on cyclones, *see* pages 11-15; and for cyclone signals as established at Réunion, *see* page 160.

Cyclone.—Local effects, &c.—Réunion, and Mauritius also, lying in the usual track of cyclones are great sufferers by them during the foul weather season, but especially during January, February, and March. The average number visiting the neighbourhood annually may be taken as 10 or 12; but from April to November vessels in St Paul roads, at the north-western end of the island of Réunion, have but little cause for apprehension from them.

Should the centre of a cyclone pass over the island, its effects are with good cause dreaded both by shipping in the vicinity, and also by the inhabitants, for the devastation to the plantations and to buildings is often most disastrous. The heavy rain which often accompanies and follows a cyclone has generally a favourable effect on vegetation, which under the double influence of heat and humidity flourishes in an extraordinary manner; but those which happen about the end of March and even in April, too late to be followed by abundant rain, do irreparable damage to the crops.

To be prepared for these visitations, it is very necessary to watch carefully the warnings of the barometer and the aspect of the sky: but of almost equal value are indications furnished by the sea, which give timely notice of approaching danger to a vessel at anchor in any of the open roadsteads of Réunion. Sometimes during an evening preceding a cyclone the weather is magnificently fine, while the sea already feels its influence; thus, a rapid current passing a vessel at anchor and a long swell arising, rolling in, and breaking on the shore should be a warning to that vessel. Rollers setting in heavily from St. Pierre to St. Benoit, and advancing from place to place until arrived at St. Denis, is an almost certain sign, often preceding a cyclone by some days. The appearance of light feathery streaks of cloud (cirrus) always announces an atmospheric perturbation probable; but when a cyclone

Chart 1497, Réunion island. Var. 9° 30' W.

is approaching the island, heavy masses of cloud (cumulus) replace the cirrus, and a thick bank of dark cloud will extend from North-north-east to South-east, the tops being of a coppery red colour and casting a metallic reflection upon the sea and surrounding objects. With such indications, before the sea becomes too rough, communication with the shore is interdicted by signal, and vessels are warned to prepare for sea.

During the cyclone season, from November to May, meteorological observations are exchanged daily at 9 a.m. and 3 p.m. between Mauritius and Réunion by cable.

Currents.—The currents to be expected in the vicinity of Réunion in approaching it from the northward are westerly; and, from the southward, south-westerly, as will be understood on consulting the article on currents in Chapter I., pages 20, 21. Resulting from this general direction, it will be found that at the eastern end of the island, when near the land, the direction of the current is very uncertain, sometimes turning northward round the northern side and sometimes round the southern side, as it may be impelled by the general body of the current approaching from the eastward. At the western end, again, there is a space with very variable currents between the two main streams. Here the stream sometimes runs to the northward and sometimes to the southward, following the line of the coast without any apparent cause for change in direction or force, though at a few miles from the coast it is said at times to attain a rate of 3 knots.

No tidal streams are perceptible anywhere round the coast.

Rollers.—These extraordinary phenomena, called by the inhabitants *Raz de Marée*, though at certain seasons and under certain barometric conditions affording a sure indication of the vicinity of a cyclone, also occur at uncertain intervals, in fine weather and during a perfect calm, unaccompanied by any change in the atmosphere or other indication. The first appearance is a long swell, not assuming the shape of an ordinary wave until it reaches the shore, on which it bursts with great violence, sometimes assuming greater proportions and grandeur than during a cyclone. Besides stopping all communication during periods varying usually from 12 to 24 hours, great injury is frequently inflicted on landing stages and other works at the water side. The probable cause of rollers here and elsewhere is mentioned at page 11, and their peculiar action and effect at Port des Galets, in the description of that port, page 171.

Climate.—The climate of Réunion is considered healthy, notwithstanding occasional intermittent fevers; and during the last few years a malarial fever, known locally as *accès jaune*, ending generally in speedy death, has given cause for much anxiety; as has also the fear of the importation from Indian ports of the much dreaded bubonic plague, from which Réunion has hitherto kept comparatively free

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though Mauritius has suffered severely from it. The first case occurred in Réunion in November, 1900, and the last on March 26th, 1901; in all there were 69 cases, of which 48 proved fatal. The hot, rainy, and tempestuous season is from November to April, and is followed by the fine season, when the heat is tempered by strong south-easterly winds.

Rains are not usually heavy or continuous at Réunion; and in consequence of the mountain chain crossing the island at right angles to the prevailing wind, the north-western part is subject to drought. At St. Denis the mean annual rainfall for a period of 4 years was 30.55 inches. At Port des Galets for the same period it was 17.25 inches. In some parts, the people depend for their water supply on the collection of rain water from the roofs in cisterns. The maximum rainfall is between December and March, and the minimum between May and October. The highest temperature observed at St. Denis is about 94°, and the mean 76°; the lowest near the coast on either side during the dry season, 59°; at St. Paul the temperature is a little higher. At St. Denis, the mean barometric pressure for a period of 6 years was 30.07. See also Meteorological tables in Appendix.

Coal.—Coal is only supplied to strangers as an act of courtesy. About 16,000 tons are usually kept in stock at Port des Galets, where there are 9 lighters of from 20 to 100 tons.

Quarantine.—The authorities are very particular and quarantine regulations are strictly enforced, principally through fear of bubonic plague, cholera, and small-pox. There is a lazaretto at the ravine Grande Chaloupe, 4½ miles westward of St. Denis, which is almost inaccessible by land.

Products.—The principal products are sugar, rum, vanilla, tapioca, starch, and coffee. On the Plaine de Cafres, 5,250 feet above the sea, the temperature is similar to that of Europe, and therefore suitable for rearing cattle, of which great numbers are imported from Madagascar. Oats, tobacco, and potatoes are grown in those high lands in sufficient quantities to form important items of export.

In 1886, the sugar produced was only 39,000 tons, though 20 years previously the production was 60,000 tons. The annual export since then has varied from 29,000 to 43,000 tons. Rum, which was formerly distilled for home consumption only, is now largely exported; the average home consumption is about 154,000 gallons, and the export for 5 years, 1905-1909, ranged from 590,000 to 870,000 gallons. The manufacture of tapioca and starch, established about the year 1890, works well, the quantity exported showing a constant increase; in 1906, 1,220 tons were exported; in 1909, 4,650 tons. Geranium culture and the distillation of perfumes is on the increase. Coffee plants were originally brought from India in 1717,

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but were extensively grubbed up to make room for the sugar cane; like it, they suffered from blight, and other plants were introduced from Liberia; but what with the blight and reduction of the area of produce, the quantity formerly raised, about 5,000 tons per annum, had become reduced to about 47 tons in 1906, but since then it has grown in favour, and new plantations have been made, the export in 1909 reaching 120 tons.

Communication.—A macadamised road runs round the island, connecting all the principal places, and also a high road passes from St. Pierre over the plain of Cafres to St. Benoit; they are as good as the mountainous nature of the country will permit, but the road between St. Denis and Possession, a distance of 7 miles, has to ascend to a height of 2,600 feet by steep gradients notwithstanding the length of road being $20\frac{1}{2}$ statute miles.

In 1882, a railroad was completed of one metre gauge and nearly 78 statute miles in length; connecting St. Benoit, St. Denis, Port des Galets, and St. Pierre. The work is remarkable, there being nearly 7 miles of tunnel; of bridges and aqueducts under 33 feet in length, more than 200 in number; also 43 large bridges, forming a total length of 8,038 feet. One span over the Rivière du Mât is 328 feet; other bridges are 1,600 and 1,900 feet long, and the viaducts are as much as 650 and 780 feet in length, and in one instance 98 feet high.

The Messageries Maritimes steamers, which leave Marseilles every fourth week, call at Réunion, as also do the steamers of the Havre Peninsular Company. See page 24.

Telegraph cables.—There is telegraphic communication between Tamatave and Réunion and between Réunion and Mauritius, and thence with the world.

Trade and commerce.—The principal articles of import are rice, dried fish, cattle, flour, and wine. The exports are sugar, vanilla, rum, tapioca and starch, coffee, and aloe fibre. The total value of imports for the year 1907 was £579,633, and of exports £552,409.

In 1909 the total number of vessels entered was 61 of a tonnage of 135,957 tons; of these vessels 42 were French, 17 British, and 2 of other nations.











Pilotage.—Where authorised pilots are stationed, pilotage is compulsory, the charge per foot draught of water being 8 francs for French vessels and 16 francs for foreigners.

Signal stations are established at St. Denis, Port des Galets, St. Paul, St. Pierre, Ste. Rose. With all these, vessels can communicate by International code.

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Chart 1497, Réunion island. Var. 9° 30' W.

Cyclone signals.—At St. Denis, St. Paul, and St. Pierre signal stations, and also on the Vigie flagstaff, St. Denis, the following signals are made, including the probable approach and general track of cyclones in the vicinity of the island. These signals are to be taken as a general guide only, and are in no way intended to prevent but rather to assist mariners in using their own judgment as to the best way of avoiding storms:—

-  Cyclone expected.
-  Cyclone approaching from the north-eastward.
-  Cyclone appears likely to pass at a considerable distance northward of the island.
-  Cyclone appears likely to pass a short distance northward of the island.
-  Cyclone appears likely to pass southward of the island, travelling from north-eastward to south-westward.
-  Cyclone appears likely to pass southward of the island, travelling from north-westward to south-eastward.
-  Cyclone appears likely to pass westward of the island, travelling from northward to southward.
-  Cyclone appears likely to pass eastward of the island.
-  Cyclone, which had already passed in a northerly direction, appears to have recurved, and is again approaching the island, travelling from north-westward to south-eastward.
-  Barometer rising; all danger over.

COAST.—The description of the coastline and anchorages now commences with Saint Denis, the capital of the island, at 10 miles westward of which is Pointe des Galets, with the port of the same name just southward of it; the intervening coast, except for about 3 miles east-

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Chart 1497, Réunion island. Var. 9° 30' W.

ward of Pointe des Galets, is high, rugged, and intercepted by deep ravines, the most remarkable headlands being Cap Bernard, Pointe du Gouffre, and Pointe de la Reine à Malheur (*see* views on chart); the only possible temporary anchorage is off the village of La Possession, about 3 miles eastward of Pointe des Galets, and presumably there must be a landing place at the lazaretto at Grande Chaloupe, as that place is stated to be almost inaccessible by land. This stretch of coast will need no further mention, and after Saint Denis, the description will follow the coastline eastward, and so round the island, terminating with Port des Galets.

Plan of St. Denis on 1497.

SAINT DENIS.—This town stands at the northern extreme of the island, and until the recent development of Port des Galets was by far the most important place both as a town and for shipping purposes. It is the sea of Government, and contained, in 1909, 25,689 inhabitants; it has large barracks, a military hospital, with a sanatorium at Salazie, a bank, numerous educational establishments, a museum, a library, and an agricultural society.

Railway.—St. Denis is in railway communication with all the coast towns eastward as far as St. Benoit, which is the terminus in this direction; and round the western and southern sides of the island as far as St. Pierre.

The anchorage is exposed to all winds from E.N.E. round by North to W. by S. and a heavy sea usually rolls in. During the bad weather season vessels take an outer berth north-westward of the town, in from 10 to 17 fathoms. In August, the fine season, H.M.S. *Euryalus* anchored off St. Denis in 13 fathoms, black sand and broken shells, good holding ground, at 4 cables from the shore, with the flagstaff in line with the centre of the church about S. $\frac{1}{4}$ W.; this proved a good position for boat communication with the shore, with a soldiers' wind. Farther westward, a vessel would experience less swell. A strong current frequently sets round Pointe des Jardins; and if a vessel has to wait for a pilot she should heave-to with her head off-shore. Pilot boats carry a flag in the bows. As already stated, from November to April, all vessels at anchor in the roads should get under way on the first appearance of bad weather.

Signals.—Vessels can communicate by the International Code; cyclone signals are also made here. *See* page 160.

Landing.—During the stay of the *Euryalus* strong and uninterrupted south-easterly winds were experienced; the landing at St. Denis was, however, good. In September, 1886, the *Bacchante* considered

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Plan of St. Denis on 1497. Var. 9° 30' N.

the landing under the same conditions to be difficult, and this appears to be the general experience, as there is always a swell setting in on the shore, and the landing of goods and passengers is effected by means of three swinging platforms or stages extending over the surf, as previously described. The framework of the jetty is of iron, and a wall supports the legs of three pairs of shears, from which the wooden platforms are suspended. Goods are landed or embarked at the outer end, where men go up or down by means of jacob-ladders; passengers may be hoisted up.

Warning signals.—When dangerous for boats to attempt landing a white flag with a blue central square is hoisted on the top-gallant yard of the harbour flagstaff; if the hoisting of the flag be accompanied by the firing of a gun, it indicates that all vessels should weigh and proceed to sea.

At night, three lights shown at the gaff, accompanied by the firing of a gun, signifies, "prepare for weighing." Four lights shown at the gaff, accompanied by the firing of a gun, signifies, "weigh and proceed to sea."

Cyclone signals.—*See* page 160.

The **Barachois** is a small creek with an area of about $2\frac{1}{2}$ acres in which boats and small coasters take refuge when the entrance is open, but it constantly requires to be cleared of obstructions thrown up by the sea. In September, 1886, the entrance was completely blocked by stones heaped up 2 feet above high water.

Harbour lights (*Lat.* 20° 52' S., *Long.* 55° 27' E.).—Two small *fixed* lights are shown vertically from the top of the lower mast of the flagstaff at the Barachois, the upper light *red*, 85 feet above high water; the lower, *white*. They are 12 feet apart, and visible from a distance of 7 miles; but beyond 5 miles they blend and appear as one.

A small *green* light is shown at the end of the Pont du Roi when a man-of-war is in the road.

Directions.—As there are no off-lying dangers, no great amount of caution is necessary in approaching the land, but from the great altitude of the island it frequently happens that the upper parts are enveloped in cloud and mist, and that the extremes of land only are visible. On coming from the northward at night it is best to **make** the light on Bel-Air point; and, from that, shape course to make the lights of St. Denis; bring them to bear from S. by E. to S.E., and judge the distance off-shore for anchoring by the depth of water.

Rivière du Butor is a small stream which discharges at a little over a mile south-eastward of Pointe des Jardins; it has an iron jetty, and was at one time considered a suitable position for a coal dépôt, though not now used as such.

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Chart 1497, Réunion island. Var. 9° 30' W.

Ste. Marie bay is $5\frac{1}{2}$ miles E.S.E. from St. Denis; anchorage may be obtained in 7 fathoms, black sand, at from 5 to 10 cables northward of the landing place, but there is no shelter whatever with the wind between W.N.W. and E.S.E. round by North.

Le Cousin rock.—This dangerous 6-foot rock, of small extent, lies opposite the Ravine des Chèvres $1\frac{1}{3}$ cables off-shore, and N.W. by W. $\frac{1}{2}$ W. one mile from Pointe des Haziers; Cap Bernard seen over the land in line with St. Denis church leads northward of the rock. (*See view on chart.*)

POINTE DE BEL-AIR.—LIGHT (*Lat. 20° 53' S., Long. 55° 37' E.*).—From a lighthouse on this point, 66 feet high, coloured white with three red bands near the top, and a black lantern, is exhibited, at 151 feet above high water, a *fixed white* light, visible in clear weather from a distance of 18 miles.

Marianne rock, above water, lies near the shore a short distance north-westward of Bel-Air point.

Ste. Suzanne is a village half a mile south-eastward of Bel-Air light. Vessels anchor off the landing place at Ste. Suzanne in 14 fathoms during the winter months, but in the fine season the anchorage is in 8 fathoms with the landing place bearing about S.W. by S. It is very exposed.

Plan of St. Benoit on 1497.

Pte. du Bourbier, on the north-eastern side of the island, is about one mile north-westward of St. Benoit. Anchorage during the fine season may be taken up in 12 fathoms, with the storehouses on the point bearing about West, and St. Benoit church about S. by W. During the foul weather season, the anchor should be in 16 or 17 fathoms on the same bearing from the storehouses, and St. Benoit church S.S.W. Vessels becalmed in this vicinity should anchor to avoid being set on the point of the Rivière du Mât, where there is no anchorage. There is a landing stage on the southern side of Pointe du Bourbier.

Saint Benoit contained, at the last census, 11,692 inhabitants; the anchorage off it is in 18 or 20 fathoms, but the bottom is very bad, and communication difficult. At least two jetties with landing stages have been constructed, but both have been destroyed by the sea. The railway fortunately renders the inhabitants and cultivators of this side of the island more independent of direct sea communication than formerly.

Plan of Ste. Rose on 1497. Var. 9° 30' W.

Ste. Rose.—Anchorage in 24 fathoms, black sand, can be obtained at about 2 cables from the shore, off Ste. Rose, between Pointe de Bonne-Espérance and Port Caron, with the sheers of the landing place in line with the middle storehouse at Varangue. The anchoring ground is limited, so that vessels must moor, and it is steep-to from the offing. There are some rocks about $1\frac{1}{2}$ cables north-eastward of Port Caron and half a cable off-shore.

Signal station.—There is a signal station at Ste. Rose, with which vessels can communicate by International code.

Chart 1497, Réunion island.

COAST.—Near the south-eastern coast of Réunion, but about 6 miles inland, is the Pic du Volcan or Grand Brûlé, the active volcano described at page 152. Nearer the coast are several lesser peaks from 2,000 to nearly 5,000 feet in height, some with distinct craters, and all of volcanic origin. This part of the coast is devoid of vegetation, streams of lava having descended to the sea in all directions.

From Ste. Rose the land, during a course of about 6 miles, trends at first south-eastward and then curves round to S. by W. as far as Pointe du Bambon, the eastern extreme of the island, just southward of which is the Anse des Cascades. *See* view on chart. From this bay, the coast again trends S. by W. $\frac{1}{4}$ W. 9 miles to Pointe de la Table, and then turns away south-westward and westward, and, still curving, northward of West for a distance of 21 miles to St. Pierre. The whole of this long line of coast is rugged in the extreme, and, with the exception of one rock close off Pointe du Bambon, appears to be clear of dangers either inshore or off-lying, but with very deep water everywhere and no possibility of anchorage. It is a dangerous coast, and should be given a wide berth; it was here, in the neighbourhood of St. Phillippe, that the R.I.M. transport *Warren Hastings* was wrecked in 1897.

Along the southern coast, commencing with St. Phillippe, are several scattered villages and hamlets, but the only one at which there appears a possibility of landing is the village of l'Angevin, where a small stream runs into the sea. This spot is about $9\frac{1}{2}$ miles eastward of St. Pierre.

Between Ste. Rose and St. Pierre there is no safe anchorage.

Plan of St. Pierre on 1497.

PORT ST. PIERRE (*Lat. 21° 20' S., Long. 55° 29' E.*).—The town of St. Pierre is on the south-western side of the island, and had, at the last census, 31,927 inhabitants; it is the terminus in this direction of the coastal railway from St. Denis. It has the usual accommodation and institutions of a town of its size, but is exposed to a very rough sea,

General charts 2899, 748a.

Plan of St. Pierre on 1497. Var. 9° 30' W.

with deep water close inshore. The port is entirely artificial, and is constructed between the shore and the barrier reef; it was commenced in 1854, and completed about the year 1892, but in 1911, having silted up, could not be used by any vessel over 10 feet draught. It consists of an inner and outer basin. The outer basin is comprised between two piers; that on the eastern side extends W.S.W. about 240 yards from Pointe á Gerard, on the eastern shore; that on the western side advances 218 yards S. by E., leaving a passage 55 yards wide between its inner end and the shore rocks, by which access is given to the inner basin. The inner basin is a rectangular space about 275 yards wide in each direction, enclosed on its western and southern sides by piers or breakwaters, and on the eastern side by the pier already mentioned as being common to both inner and outer basins. From the inner part of this pier, a horn or arm in masonry projects into the outer basin with a curve or sweep until it becomes parallel with the common jetty at a distance of 55 yards from it and 88 yards N.E. from its outer end. It is important not to mistake these pier-heads, as the entrance to both basins lies eastward of the curved horn, and between the horn and the jetty common to both basins a cul-de-sac is formed.

Entrance.—Depths.—About $2\frac{1}{2}$ cables outside the curved horn-head is a small $2\frac{3}{4}$ -fathoms patch. The entrance channel on the outside has a least depth of 21 feet, and its breadth varies between 170 and 70 yards. In the outer basin the channel narrows quickly to from 50 to 65 feet, with a least depth of 18 feet. The part of the outer basin comprised between the coast and the actual channel dries at low water.

In the inner basin, partly filled up, there is only a mean depth of $15\frac{1}{4}$ feet, and that only for a distance of 394 feet, with a breadth of 230 to 65 feet; patches, however, exist with only 12 feet over them, and there is one at the entrance to the fitting basin with only $7\frac{3}{4}$ feet; consequently, owing to the difficulty of swinging, it does not permit of vessels drawing more than 10 feet entering.

St. Pierre road.—During the foul weather season vessels anchor in the open roadstead in about 27 fathoms, sand and gravel, with the tower of the church seen up the ravine bearing N.N.E. $\frac{1}{2}$ E. During the fine season, vessels may go about 2 cables closer in, or 4 cables outside the East pierhead, on the same line, and anchor in from 20 to 23 fathoms. They should always be ready to weigh quickly, especially with any appearance of wind from South-west. Vessels in either of these positions roll heavily, and the hardness of the bottom frequently causes the loss of anchors and cables. They, however, sometimes unload and load here, and there are three landing stages available.

Harbour light (*Lat. 21° 20' S., Long. 55° 29' E.*).—On the flag-

General charts 2899, 748a.

Plan of St. Pierre on 1497. Var. 9° 30' W.

staff at the Port office, a small *red fixed* light, visible from a distance of 3 miles, is exhibited at 72 feet above high water.

Signal station.—This being a signal station, vessels off the port can communicate by International Code. Cyclone signals are also in use at this port. *See* page 160.

There are no pilots.

Chart 1497, Réunion island.

Villages.—Anchorages, &c.—St. Louis is a small town on the side of an open bay about 5 miles north-westward from St. Pierre; at the last census it had a population of 12,846. A reef in front of the town prevents ready access to the shore, but this and all the other towns westward of St. Pierre have the benefit of intercommunication by means of the coastal railway.

Etang Salé is a village 9 miles north-westward of St. Pierre, and so named from its vicinity to a salt water pond. A reef, enclosing the village, extends nearly 5 cables from the eastern side of the bay.

Inferior anchorage may be found in 15 fathoms, coral, with Pointe des Avirons, close by, bearing N.E. by N. or N.E. The bank of soundings is steep-to, the depth rapidly increasing to 50 and 75 fathoms at $1\frac{1}{2}$ miles off-shore.

The landing place is behind the end of the reef and southward of the village; it is both difficult and dangerous, as the sea takes a boat on the broadside while entering. Communication with the shore, when dangerous, is prohibited by signal from the flagstaff of the Port office—a white flag with a blue square in the centre being hoisted. The sea gets up so quickly that a boat may land and not be able to return for days, the vessel in the meantime being obliged to put to sea.

St. Leu (*Lat. 21° 10' S., Long. 55° 18' E.*), about 2 miles northward of Pointe de Bretagne, is another open anchorage opposite the village of St. Leu, westward of the Port office flagstaff, where the shore cannot be approached in safety to a less depth than 23 fathoms. As the holding ground is not good, vessels should always be ready to put to sea on the appearance of westerly wind or rollers. There are two landing stages at St. Leu.

Plan of coast about St. Gilles on 1497.

St. Gilles is a small place at the western end of the island, one mile southward of Pointe des Aigrettes. Here some large streams fall into the sea during the rainy season, and opposite the discharge of this large body of fresh water is an opening in the shore reef which forms a boat cove; a perch on the rocks marks the southern side of the entrance. There are also two perches on the Chameaux rocks $1\frac{1}{2}$ miles farther South.

Anchorage will be found in St. Gilles road in 18 or 20 fathoms about 6 cables off-shore, with the Magazins Desbassyns bearing about
General charts 2899, 748a.

Plan of coast about St. Giles on 1497. Var. 9° 30' W.

E. by S., Cap Noir E.N.E., and Pointe des Aigrettes N.N.E. This anchorage is only safe with off-shore winds.

Pointe des Aigrettes is the western extreme of the island of Réunion, and Cap la Houssaye $1\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. from it is the south-western boundary of the bay of St. Paul; in the projecting rocky points of La Houssaye are formed three small coves, in the northernmost of which, Trou du Cuisinier, is a natural quay, where landing may generally be effected when the state of the sea prevents communication by boat with St. Paul. A road cut on the side of the hill leads from the cove to St. Paul, 2 miles distant.

Plan of St. Paul on 1497.

ST. PAUL BAY and TOWN (Lat. $21^{\circ} 0' S.$, Long. $55^{\circ} 11' E.$).—The bay of St. Paul, at the north-western end of the island, is $6\frac{1}{2}$ miles wide between Pointe des Galets and Cap la Houssaye; it possesses the only good roadstead round the shores of Réunion. The town has enjoyed considerable importance in consequence of its roadstead, but has declined; and now that fairly good basin accommodation is provided at Port des Galets the commercial establishments have removed to that locality. It is connected by railroad with all places on the coast from St. Pierre round by St. Denis to St. Benoit. The population of St. Paul at the last census was 20,091.

Anchorage.—During the fine season, from the middle of April to the middle of November, when the south-easterly wind prevails, as described at page 155, a sort of eddy wind generally enters St. Paul bay from the south-westward; vessels then anchor in from 13 to 18 fathoms, muddy sand, and, if moored, with open hawse to the South-west, the harbour flagstaff bearing about E.S.E. or S.E. During the foul weather season, the wind is generally north-easterly and the best anchorage is in 20 fathoms, with the flagstaff bearing S. by E. The holding ground is everywhere good, but especially so in the latter position.

Vessels occasionally take shelter here after having been driven to sea from St. Denis road. The rollers are less felt in St. Paul bay, communication being seldom interrupted for more than 10 or 12 hours at a time, and even cyclones are less to be feared here than elsewhere, as explained already at page 156.

Signals.—A signal station is established at St. Paul with which vessels can communicate by International Code. Cyclone signals (*see* page 160) are also made at this place.

Plan of Port des Galets on 1497.

Pointe des Galets.—This low point, projecting upwards of 3 miles from the high land, is steep-to, vessels being able to pass it at

General charts 2899, 748a.

Plan of Port des Galets on 1497. Var. 9° 30' W.

a distance of one cable. When the peak of Cimandef is seen over the ravine of the Rivière des Galets, a vessel is westward of the point. This mark is usually visible at night, and is useful in recognising the position of Port des Galets, and of the bay of St. Paul, should the light at Pointe des Galets for any reason not be seen.

LIGHT (*Lat. 20° 55' S., Long. 55° 18' E.*).—A quick-flashing white light, visible from a distance of 15 miles, is exhibited at 328 yards within the extreme of Pointe des Galets, at 90 feet above the sea, from a grey stone tower 64 feet high. For arc of visibility, see Light list.

Mooring buoy-light.—Two nights before a mail steamer is expected (the packet being due on the 10th and 21st of each month) a white light is supposed to be shown on a mooring buoy placed in 50 fathoms, with Pointe des Galets lighthouse bearing N.E. by E., distant one mile.

No dependence can be placed on this buoy or its lights in so exposed a position, owing to the great depth of water.

Local current.—As previously stated (*see* page 157) the current at the western end of the island and off Pointe des Galets usually follows the direction of the coastline one way or the other, and at 2 miles or more off the land sometimes attains a rate of 3 knots; but on nearing the entrance of Port des Galets it has never been known to attain a rate of one knot. A series of observations made during several consecutive months in 1888, showed that although the current always ran directly across the mouth of the port, either northward or southward, and most frequently the former, it never exceeds a rate of seven-tenths of a knot. To counteract its effect on a large vessel entering, she should maintain a speed of 3 knots until beyond its influence.

PORT DES GALETS.—This port, which is entirely artificial, is three-quarters of a mile southward of Pointe des Galets; its total area is about 39½ acres, and the excavations amounted to 2½ million cubic metres. It was opened in February, 1886, when six vessels were admitted and secured in the basin, including the transport *Seudre*—209 feet long and drawing 16ft. 5in.; also the *Ville de Tarragone*—262 feet long, drawing 16ft. 1in. The port is not suitable for vessels over 3,500 tons.

The position chosen being low level land, the harbour was excavated in permanent ground, and having deep water close to the shore it was hoped that the entrance would be easily kept free, which has, however, not proved to be the case. The work comprises an entrance, an outer port, and a basin; and all the principal wharves have railway lines and connections.

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Plan of Port des Galets on 1497. Var. 9° 30' W.

Depths.—The depth of 27 feet at the entrance of the Outer port exists only in the central third part of the passage, in which part large vessels entering or leaving must be rigorously kept or they may be endangered by boulders and stones on either side of the deep central channel. The action of the sea causes such an influx of gravel both in the entrance channel and in the Outer port as to render dredging almost constantly necessary in both. The general depth in the Outer port, in the basin, and alongside the quays, is $26\frac{1}{2}$ feet.

In 1907 the British ss. *Rahmani* struck in entering the port; it is suggested that she struck a block of concrete that may have been washed nearly into the central channel by heavy seas.

The entrance (Lat. $20^{\circ} 56' S.$, Long. $55^{\circ} 18' E.$) is 820 feet long, protected by two moles or breakwaters projecting 328 feet from the beach but inclining towards each other, so as to reduce the amount of sea which might enter in rough weather; their outer ends being only 295 feet apart at the top and 164 feet at the base. These moles are $47\frac{1}{2}$ feet wide at the top, and nearly 8 feet above water; the lower blocks of concrete of which they are composed weigh 20 tons; and the upper block 120 tons; the works have withstood several cyclones.

The Outer port is 820 feet square, and has a uniform depth of $26\frac{1}{2}$ feet; here the waves which enter were expected to expend themselves, and the piers or walls being about 30 feet high, the hulls of vessels are protected from the wind. From the north-eastern angle of the Outer port a passage 492 feet long, 180 feet wide at the top, and $26\frac{1}{2}$ feet deep, leads into the basin.

The Basin is 754 feet in extent, North and South, and about 1,300 feet East and West; the general depth of the clear space of the basin is $26\frac{1}{2}$ feet, but its eastern side is divided into two open docks by a mole extending from the middle of that side into the basin. This mole is 657 feet long and 197 feet wide at the water's edge. The North dock has a depth of $26\frac{1}{2}$ feet. The South dock has a depth of $26\frac{1}{2}$ feet, and is provided with three wooden jetties at which vessels can lie, each jetty communicating with a storehouse; and, from the height of the ground, the upper platform is on a level with the storehouses, and on the lower platform is a tramway connected with the railway system.

On the western bank of the basin, of which no part is faced with masonry, is the coal dépôt of the Messageries Maritimes. At the northern end there is a wooden pile wharf 213 feet long by $29\frac{1}{2}$ feet wide, at which vessels discharge and load; though lashed to the jetty, they usually have their starboard bower anchor for an off-fast. A slip has been constructed in the south-western corner of the basin.

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Plan of Port des Galets on 1497. Var. 9° 30' W.

The landing place is at the eastern end of the South dock; near it are the Custom-house, the Post office, and the Telegraph office.

Beacons.—The limit on each side of the navigable part of the entrance channel is marked by two pairs of beacons on the eastern bank of the Outer port; they are made of sheet iron, each being surmounted by a St. Andrew's cross, and painted white. Each pair of beacons indicates a line parallel to the other, between which a vessel drawing less than 25 feet may run in freely. To distinguish these beacons from others, set up as required for the guidance of the dredgers, the line of direction has been lengthened by the addition of two strips of iron, whitewashed, which hang on the bank at the inner part of the Outer port. These marks may be seen from a great distance at sea, especially during the afternoon when the sun shines on them.

Buoy (*Lat. 20° 56' S., Long. 55° 18' E.*).—As the right-angled turn from the Outer port into the channel for the basin is a difficult operation in such a limited area, a transporting buoy is moored in the north-eastern part of the Outer port, to assist vessels in making the turn, and a harbour boat is always in attendance to run out a warp.

Facilities, repairs, &c.—Steam cranes for loading or unloading are always available, also two pairs of sheers capable of lifting 22 tons. There is a well-fitted factory capable of repairing the largest steamer, but vessels requiring dry dock accommodation have to go to Mauritius. The port possesses four lighters of 20 tons each and five of 100 tons; and three steam tugs, two of which are chiefly used in towing the dredgers and ballast barges, but the third, a vessel of 240 horse-power, is for the towage of sailing vessels in or out of port.

Signals.—The port signal-staff, a mast with two yards, stands on the eastern side of the channel, connecting the Outer port with the basin. Vessels in the offing can communicate by International Code. The signal that entry to the port is impracticable, on account of rollers, is the hoisting of flag S of the International Code. When flag B is hoisted it signifies that the channel is engaged for the time and vessels must wait. Flag P signifies that the channel is open. Cyclone signals are also made at this port. *See* page 160.

Pilots go out to meet approaching vessels on the usual signal being hoisted, and board them at 3 or 4 cables outside the entrance. All the movements in the port, also the control of the pilots and police, are under the Lieutenant of the port.

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Plan of Port des Galets on 1497. Var. 9° 30' W.

Quarantine.—Vessels having a clean bill of health and being in good sanitary condition may enter the port and make fast after communicating with the pilot; but they must fly the yellow flag and avoid all communication until admitted to pratique, which can only be granted by the medical officer, who lives at Saint Paul.

Supplies.—Fresh provisions, but of an inferior quality, may be obtained; no vegetables are obtainable between December and April.

Very good water may be obtained from a hose alongside the quay, on application to the Harbour Master, for 5 francs per first 10 tons and 3 francs per every additional 10 tons.

Coal.—About 16,000 tons is imported annually, 15,000 tons being usually kept in stock. Most of the coal belongs to the Messageries Maritimes Company, and is only supplied as an act of courtesy.

Coaling is generally done from lighters, but there is a coal wharf 262 feet long which has a depth of 26 feet of water alongside.

Tides.—It is high water, full and change, at 2h. 42m.; springs rise $1\frac{3}{4}$ feet, neaps $1\frac{1}{4}$ feet.

Rollers.—The local effect of this phenomenon is sometimes to stop entirely both the entrance and exit of all vessels, also to displace a quantity of sand and shingle, necessitating the labour of clearing the channel by dredging. The rollers also cause considerable inconvenience and even danger to vessels lashed to the jetties in the basin, the swell driven in being sometimes so violent that special lashings and moorings are rendered indispensable.

During the winter, May to October, the season of the S.E. trade wind at Réunion, the higher latitudes of the Indian ocean are subject to frequent and heavy gales (*see* page 5); the effect of these storms is often felt at a very great distance through the propagation of an ocean swell of more or less magnitude, and on encountering a steep isolated shore, such as Réunion, these undulations are suddenly arrested, and there arises a succession of violent shocks, called by the French *Raz de Marée*, and by English seamen, *Rollers*. No indication or forewarning whatever is given of their approach; they begin and end at this season without any local or apparent cause.

At Port des Galets the rollers rarely continue more than one day, and though they occur at all seasons, they are less frequent during the summer, November to March, and when they occur at that season are generally either the forerunner of an approaching cyclone or the result of its passage near the island. The greatest number of these visitations have been experienced in August, and during that month they may occasionally continue two or even three days.

When the rollers do not set in severely or are of small importance, each succeeding undulation spreads itself along the sides of the entrance

General charts 2899, 748a.

Plan of Port des Galets on 1497. Var. 9° 30' W.

channel, leaving sufficient space in the centre for vessels to enter, and still better for their departure; but when they set in with violence, the undulations spread across the whole space between the piers, and rise from 6 to 10 feet above the ordinary level. At such a time the entrance is impracticable for large vessels of deep draught, which would certainly strike the ground; vessels of smaller size might also become unmanageable in the violent eddies caused by the back-lash and off-set.

After the swell which forms the roller has entered the Outer port, it diminishes gradually towards the eastern side, where it produces a great surf. A portion of the wave, deflected northward by the bank on that side, enters the passage to the basin and the two docks; here its force becomes expended, producing more or less swell and surf according to the height of the rollers outside, and subjecting vessels lashed to the jetties to considerable inconvenience and risk of damage as before mentioned.

Directions.—On approaching from seaward, the principal landmarks are the peak Cimandef and the light or lighthouse on Pointe des Galets. The entrance to the port should be brought to bear about E.S.E., and so maintained, the set of the current being observed and the effect neutralised by change of course. It is strongly recommended to bring those beacons in line which indicate the weather side, as regards current, when at some distance outside, so as to ensure time to preserve it steadily with a small helm before entering between the piers. Neglect in this particular, and the endeavour to make a short turn, cause great risk of grazing the jetties or of grounding.

A vessel should enter with her line of keel parallel with the direction of the channel, and at a speed of 3 or 4 knots. The great height of the banks makes them appear nearer than they are, and those who enter for the first time are liable to fear having too much way on the vessel; they should bear in mind that the distance from the pier-heads to the inner part of the Outer port is over 500 yards, and that the banks are steep. The engines should be stopped immediately the vessel's head is within the piers. With a long vessel and strong current, the stern may be swept to leeward while the bow is in still water; that result must be anticipated by using the helm quickly and freely to keep the stern up to windward in order to preserve the direction of the channel and to avoid being set towards the lee pierhead.

A harbour boat meets the vessel in mid-channel with a hawser from the transporting buoy, to be taken in on the port bow; a ship's boat should also be ready to assist with hawsers, which are not always worked as quickly as may be desired. The vessel's way must be stopped in time, but her bow may go up to within about 20 yards from the inner side of the Outer port, as it makes the turn towards the passage easier.

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Plan of Port des Galets on 1497. Var. 9° 30' W.

With the hawser from the buoy to the port bow, the helm *hard-a-starboard* and the engines turning slowly ahead; also, if necessary, a rope from the starboard quarter to one of the bollards on the bank—the vessel will turn eight points to port, point directly through the passage to, and may enter the basin and secure as desired.

On leaving, the best way to ensure keeping in mid-channel is to look astern and keep between the lines indicated by the beacons, as well as directing the vessel's head. When the bow clears the pierheads, the current will carry it to starboard or port unless the helm be applied quickly.

General charts 2899, 748a.

CHAPTER V.

ALDABRA ISLANDS.—ASSUMPTION ISLAND.—COSMOLEDO GROUP.—
ASTOVE ISLAND.—PROVIDENCE ISLANDS.—FARQUHAR ISLANDS.
—COMORO ISLANDS.

(Lat. $9^{\circ} 10'$ S. to lat. $15^{\circ} 10'$ S.)
(Long. $45^{\circ} 0'$ E. to long. $52^{\circ} 30'$ E.)

Variation in 1911.—Decreasing $6'$ to $8'$ annually.

Plan of Aldabra island on 718. Var. $5^{\circ} 30'$ W.

ALDABRA.—General description.—These islands are first mentioned in 1511, and called Ilhadara, and occur afterwards on various charts as Alhadara, but this name is probably a misconstruction of the Arabic word *Al-Khadra*—the green. The islands have been visited by several scientific expeditions between 1893 and 1909. At the latter date by Mr. J. C. F. Fryer, who spent several months on the islands, and from whose description in the *Geographical Journal* of September, 1910, the remarks in this work are principally taken. Considered collectively, the islands are an atoll 19 miles long East and West, and from 5 to $7\frac{1}{2}$ miles wide; they are divided by narrow passes into four main islands, called Picard (West island), Polymnie, Malabar (Middle island), and Main or South island.

The whole of the atoll is either coral or coral rock, and is losing on all sides in its fight with the sea, the only gain being a tendency to pile up sand in certain places. The seaward face has abrupt overhanging cliffs, 12 to 15 feet high; the true surface of the island is from 12 to 20 feet above high water, and the sand dunes reach a height of from 50 to 60 feet. The islands are clothed in places by a thick, almost impenetrable pemphis jungle, the plants being 12 to 15 feet in height, and mangrove forests flourish, some of the clumps being 70 or 80 feet high. The islands are generally visible from a distance of about 15 miles; they are a dependency of Seychelles, and leased to M. A. D'Emmerez. The fringing reef is everywhere narrow, never exceeding 3 cables from the shore, and is steep to all around except at the eastern end, where a bank of soundings extends about 3 miles.

Produce, &c.—The chief industry is the removal and drying of the bark of the mangrove; the atoll possess a very complete outfit for the work, but owing to wasteful methods but little profit can be

General charts 2762, 597, 748b.

Plan of Aldabra island on 718. Var. 5° 30' W.

obtained, and the forests are being ruined. The giant land tortoise is to be found in some numbers on Main island, and also, though not commonly, throughout the rest of the atoll. Green turtle, of which there are two distinct groups, one resident and small in number, the other migratory and visiting the atoll in vast hordes from December to April to breed. The tortoise shell turtle occurs sparingly in the lagoon. Fish are abundant, but it is impossible to use a net. A few cocoanuts have been planted in the sandy soil, but seem likely to be somewhat dwarfed. There is very little agriculture; vegetables might be grown in the wet season, but in 1909 there was an absolute lack of green food. Rats are a perfect plague throughout the islands. Aldabra is preserved, and no shooting or turtling is allowed.

Water.—There is a fresh water spring at Tacamakass, the only one in the atoll. Rain water for the use of the inhabitants is collected and stored.

Communication.—A government schooner from Seychelles visits the islands about 5 times a year; she usually carries a medical officer, who acts as magistrate.

The lagoon is very shallow, with a muddy bottom towards the outsides and sandy in the centre; channels from the passes radiate into it, deep at first, but soon become as shallow as the rest of the lagoon, which in most places is only just covered at low water springs. The shore is overgrown with dense mangrove swamps, which are eating the coral away.

The lagoon has apparently deepened since the survey in 1878.

There are four passes into the lagoon, which are described later.

ISLANDS.—**West island** (Île Picard) (Lat. 9° 22' S., Long. 46° 15' E.), at the N.W. extreme of the atoll, is about 3 miles long, and averages one mile in width; it is flat, and, like all the other islands, is nearly covered with the open or varied type of jungle. It is much broken and indented on the lagoon side by mangrove creeks and swamps. About 1¼ miles from the southern end of West island is the settlement, consisting of a number of huts for the labourers, a house for the manager, a store, and four large ongars for drying mangrove bark, near a flagstaff, from which the Union Jack is shown when a vessel appears in sight. Here water is collected from the corrugated iron roofs of the houses, and stored in tanks and covered coral basins. Scarcely any rain falls except during the N.W. monsoon. The western coast of this island is the only long sandy beach on any of the islands, and there the turtle land and deposit their eggs.

South island (Main island) extends the whole length of the group, including both ends and a portion of the northern side at the

General charts 2762, 597, 748b.

Plan of Aldabra island on 718. Var. 5° 30' W.

eastern end, its length being about 19 miles; it is nearly all faced with overhanging coral cliffs, 12 to 15 feet high; this sea face is more barren than elsewhere on account of the spray and sand continually blown over it. The western part of the island is all pemphis jungle, and eroded rock; near the centre are the sand dunes, 50 to 60 feet high, which are the highest points of the atoll. The eastern part of the island differs markedly from the pemphis country, for the rock is more or less flat, and is covered with a thin layer of guano soil, while the jungle is open and varied; near the south-eastern end, at Tacamakass, is the only fresh water spring in the atoll, called Wilson's well. Hodoul point, the eastern extremity of the atoll, is bordered by a plain of white sand, partly covered with bushes.

Middle island (Malabar island), occupying the space $9\frac{1}{2}$ miles long on the northern side of the atoll between the East channel into the lagoon and Johnny channel, is very similar to the other islands but higher, especially at the eastern end, where for the space of a mile there is a growth of large trees; casuarina trees also grow on the western end of the island.

Polymnie island, 2 miles long, occupies the space between the western end of Middle island and West island, being thus bounded at its eastern end by Johnny channel and at its western end by the Main channel into the lagoon. But for the narrow channel at its eastern end it might be considered as a portion of Middle island.

Cocoanut island (Ile Michel), within the lagoon opposite the eastern entrance, is a suitable site for a house; it has a sandy area with long grass, and some fine casuarinas. Of the remaining small islands in the lagoon the majority are composed of metamorphosed coral rock of the curious mushroom shape.

PASSES.—Main channel (Great pass).—**Depth, &c.**—The main channel into the lagoon is a deep pass leading between West and Polymnie islands, with the reef dry on either side at low water, and even at high water it is well defined. The entrance points are rocky cliffs, on which are thick groves of casuarinas. The channel takes a general southerly direction for $1\frac{3}{4}$ miles, and is about 260 yards wide, the sides steep-to, and with from 7 to 12 fathoms water; a central reef then divides it into two channels, both deep, but only half the width of the outer part.

The eastern branch continues for $2\frac{1}{2}$ miles, when it is lost in the lagoon in innumerable patches of coral, with from 3 to 5 fathoms between them, but the spaces are too intricate for navigation. The western branch also leads into the lagoon, and similarly terminates in a labyrinth of coral patches.

General charts 2762, 597, 748b.

Plan of Aldabra island on 7 18. Var. 5° 30' W.

West channel, between West and South islands, is a mile wide but obstructed by islets and reefs, between which are several narrow shallow passes, only fit for boats at high water, and when the sea is smooth; the best of these channels, known as Lanier pass, is between the third and fourth islets southward from West island.

Of Johnny channel there are no particulars, but it is evidently so narrow and leading into so shallow a part of the lagoon that it can only be used by boats at any time.

East channel (Passe Houareau) (*Lat. 9° 22' S., Long. 46° 27' E.*), between Middle and South islands, is passable at all times by boats; it is a narrow deep pass through the coral, about three-quarters of a mile in length, and the reef on either side is dry at low water.

Anchorage.—In the South-east trade, the best anchorage is opposite the entrance of the Lanier pass in the West channel, just described, and about 150 yards from the reef. It is possible for a vessel to anchor off the western point of the island close to the reef, but the space scarcely allows for swinging towards the shore, an event which may happen if the wind falls light or veers far to the southward.

A good berth, with more room, is off the eastern shore of the Main channel, where a vessel may anchor in 11 fathoms, with the North extreme of Middle island S. 82° E., the West extreme of the eastern point of entrance S. 31° E., and the North extreme of West island bearing West. In this position, a vessel is in the line of the flood stream into the lagoon, but not of the ebb, which sets out on the western side of the channel.

In the N.W. monsoon, anchorage may be found off and southward of Houdoul point on the bank extending from the eastern end of the island, which, however, has not been closely examined.

There is good anchorage within the main channel, before it divides, and about 1½ miles from the entrance. A vessel should moor in about 9 fathoms, coral, with Round apex open southward of the south-eastern point of West island; open hawse to the eastward and with a good scope on each cable, the holding ground being bad, and the strong tides rendering it likely that the anchors may come home. No mooring swivel is required, the trade wind causing the vessel to swing the same way and thus keeping the hawse clear. It is quite smooth at this anchorage, but the strong tides make it inconvenient.

Small vessels can pass through the Main channel into the lagoon, which has anchorage in a limited space, with 4 fathoms water.

Tides and Tidal streams.—It is high water, full and change, at Aldabra at 4h. 0m.; springs rise about 8 feet, neaps 5 feet; the flood stream runs through the passes about 1h. 15m. after high water, and the ebb stream a similar time after low water. Throughout the Main channel and its different branches the stream runs with great

General charts 2762, 597, 748b.

Plan of Aldabra island on 718. Var. 5° 30' W.

velocity, at springs attaining a rate of $6\frac{1}{2}$ knots, with scarcely any slack water; at neaps, it runs $2\frac{1}{2}$ knots.

Plan of Assumption island on 2762.

ASSUMPTION ISLAND* (*Lat. 9° 46' S., Long. 46° 31' E.*), nearly $3\frac{1}{2}$ miles in length N.N.E. and S.S.W., by $1\frac{1}{2}$ miles in width, is an elevated coral reef; it has a maximum rocky elevation of 20 feet, which is found on the west coast about 250 yards from high water. The west coast consists of a sloping sandy beach, but the greater part of the island is bounded by abrupt overhanging cliffs, like Aldabra. On the south-east side of the island are a series of large sand dunes, about 90 feet high, to seaward of which there is no fringing reef, though the water is shoal for a distance of about one mile off this point.

Assumption was apparently at one time larger than it is now, and will probably in time split up into a number of isolated rocks, and may disappear altogether. The island is covered with low tangled vegetation, and the surface is largely coated with guano, which is worked and exported. A rubber plant grows wild on the island.

Green turtle are even more numerous than at Aldabra, as the sand-bank along the western coast forms an ideal spot for the females to lay their eggs.

The settlement is on the northern side of the west coast.

Water.—The great difficulty is in obtaining fresh water, though a well in the sand near the settlement yields a small quantity of slightly brackish water, which, with what can be collected during the rains, is nearly enough for the drinking purposes of the settlement.

Plan of St. Thomas anchorage on 2762.

Anchorage.—The best anchorage during the South-east trade is St. Thomas anchorage, in 10 fathoms, about $1\frac{1}{2}$ cables distant from the land near the settlement, with a conspicuous clump of trees northward of the settlement bearing E.S.E., and the near extreme of the land to the southward bearing S. $\frac{3}{4}$ W. In the bay on the lee, or western, side of the island anchorage might be found anywhere at about 150 or 200 yards from high water mark, but there is not room for a vessel to swing, and she would have, probably, 28 to 30 fathoms under the stern. There is reported to be anchorage off the S.E. point of the island during the N.W. monsoon.

Tides and tidal streams.—It is high water, full and change, at about 4h. 0m.; springs rise 11 feet, neaps 6 feet. At St. Thomas anchorage the flood stream sets W.S.W. at the rate of 3 knots at springs, and the ebb stream E.N.E. at the rate of one knot at neaps. There is reported to be no current in the bight to the southward.

Plan of Cosmoledo group on 718.

COSMOLEDO,* of oval form, $9\frac{1}{2}$ miles long East and West, and

*J. C. F. Fryer, *Geographical Journal*, September, 1910.

General charts 2762, 597, 748b.

Plan 718, Cosmoledo group. Var. 5° 20' W.

7 miles wide, is of typical atoll formation, the maximum rock elevation is 15 feet above sea level, but, unlike Aldabra, the land rim is very imperfect, not more than one-half the atoll's circumference being capped with land. All the islands show signs of great erosion, both on the seaward and lagoon sides, and judging by the number of rocks and small islands there is no doubt the land rim was once as complete as that of Aldabra. Eight low coral islands and many islets stand on the ring surrounding the central lagoon, which is generally shallow, and in most places much encumbered by rocks. The outer edge of the reef is everywhere steep-to, and its average width outside the islands is about $2\frac{1}{2}$ cables.

The Cosmoledo islands are leased from the Seychelles Government. The industries are turtle catching, fish curing, and guano digging, all of which are exported to Seychelles; there is also a certain amount of maize cultivation on Menai and Wizard islands. The principal settlement is at Menai, but there is a smaller camp at Wizard. Water is caught and stored in tanks; there is a well at Wizard, and there are also appliances for distilling water if the supply should run short.

Menai island (*Lat. 9° 42' S., Long. 47° 32' E.*), the largest and westernmost of the group, is $1\frac{3}{4}$ miles in length. In the centre of the lagoon side of the island are tall mangroves reaching 60 feet above high water; at the southern end, a clump of trees forms an apex 45 feet high, and on the north-eastern part is a ridge of sand-hills about 40 feet high, with a growth of stunted casuarinas; elsewhere the island is low and fairly open. There are some young cocoanut trees on the island which, though small, appear healthy.

Johannes point is of rock; it appears to project considerably when seen from the southward, and has two trees standing alone at its extreme. The settlement is at the southern end of the island, and is indicated by a flagstaff; here also is the apparatus for the collection and storage of rain water before mentioned. A few goats and fowls are to be found on the island, but cultivation is rendered extremely difficult through the destruction wrought by swarms of rats and land crabs.

Anchorage may be found during the S.E. monsoon in from 8 to 13 fathoms about one cable from the reef off the north-western part of Menai island, but the bank is very steep, and a strong gust would probably send a vessel off into deep water, though the *Fawn* held on well here, with 40 fathoms under her stern when swung off-shore. A good mark for letting go the anchor is with the West extreme of Menai island S. 21° W., the North extreme S. 73° E., Observation islet showing just clear; and the trees on Johannes point S. 16° W. Here the sea is smooth and but little swell passes round the island.

During the N.W. monsoon, the anchorage is at the entrance of the

Plan of Cosmoledo group on 718. Var. 5° 20' W.

S.E. passage just westward of Wizard island. There are no other anchorages around the group.

Landing.—During the South-east monsoon, landing can be effected at high water in the bay northward of Johannes point; and even at low water, by landing on the higher outer edge of the reef and wading, but at times there is too much swell for this.

Observation islet is the third large rock eastward of Menai island, and distant from the north-eastern point about 6 cables.

North islands are at the northern point of the atoll reef, nearly three-quarters of a mile apart; the western island is 5 cables long, 25 feet high, rocky, and covered with bush; the other is nearly round, about 2 cables in diameter, and 15 feet high.

Goelette island, S.E. $\frac{1}{2}$ E. distant 4 miles from the eastern North island, and half its size, is 10 feet high, and close to the edge of the reef, through which there appears to be a shallow break just south-eastward of it. The little rock *Ile du Trou* lies one mile north-westward of Goelette island.

Polyte island (Lat. $9^{\circ} 42' S.$, Long. $47^{\circ} 40' E.$), on the eastern side of the reef, is a narrow strip nearly a mile in length North and South, and has a hummock at its southern end 35 feet high.

Wizard island, at the south-eastern corner of the atoll, is 2 miles in length, with a mound 55 feet high at its northern end, and another at the southern end 40 feet high. The island is sandy, and fairly open. At the north-eastern point is a fishing station and contrivances for the collection and storage of rain water, as at Menai island. On Wizard island the *Merry Monarch* was wrecked in 1874, on her way from India to Boston, and in 1895 the wreckage was still lying in heaps on the southern side of the island.

Pagoda island, on the southern reef, is very small, and 20 feet high. It is $1\frac{1}{2}$ miles westward of Wizard island, and the S.E. passage is between them.

South island, commencing 6 cables westward of Pagoda island, is $1\frac{3}{4}$ miles in length and very narrow, with some sand hillocks covered with bush about 20 feet high; towards the western end are some high mangroves; as its name implies, it is the southernmost island of the group.

Lagoon.—Entrances.—The Lagoon, approaching circular in shape and about 5 miles in diameter, is much encumbered with shoal patches and banks, but, towards its north-eastern side, there is a tolerably clear space 3 miles long and one mile wide, with $3\frac{1}{2}$ and 4 fathoms water. There are several breaks in the reef, but only two passes through it; one, the S.W. pass, leads into a shallow part of the lagoon; the other, the S.E. pass, is the best, but is narrow, ill-defined, and

General charts 2762, 597, 748b.

Plan of Cosmoledo group on 718. Var. 5° 20' W.

being on the weather side during the South-east monsoon, a heavy swell then rolls in. The tidal streams are strong in both passes.

The S.E. pass is midway between Wizard and Pagoda islands. A 6-fathoms channel, about 250 yards wide, leads through in a general N. $\frac{1}{2}$ W. direction for about 7 cables; it is then divided into two by a reef awash at low water; the eastern channel runs in a N.N.E. direction $1\frac{1}{2}$ miles farther with from $3\frac{1}{2}$ to 4 fathoms, but it is not straight, and the eastern reef is the plainest to be seen; it then opens out into the clearest part of the lagoon, above described.

This pass is difficult, as, from its shallowness, it is not easy to distinguish the channel from the adjacent shoals, the reefs at the sides not being steep-to, and the water so clear that the bottom is almost as distinct 5 fathoms deep as at 2 fathoms.

During the South-east monsoon, wind and sea set straight into it, and although the water becomes smooth after passing the line of breakers, it is very rough at the entrance. In the North-west monsoon, it is practicable with care for a vessel under steam, drawing 16 feet.

The S.W. pass, between South island and Menai island, is about the same breadth and depth, and rather steeper on either hand than the other, but it unfortunately leads into a shallow and foul part of the lagoon, and is therefore useless except as a boat passage. In the South-east monsoon it is tolerably smooth at the entrance, but the sea takes a vessel on the beam in entering.

Boat pass.—To enter the lagoon in a boat from the anchorage off Menai island, the best pass over the reef is close northward of Middle islet, where there is a depth of 3 feet at high water, neaps.

Tides.—Tidal streams.—It is high water, full and change, at Cosmoledo, at about 4h. 0m.; springs rise about 8 feet, neaps range 2 feet. At the anchorage off Menai island the tidal streams are strong; the ebb sets north-eastward, augmenting the ordinary set of the equatorial current round the island. The flood, during neaps, barely neutralises the set; at other times it runs south-westward.

Plan of Astove island on 718.

ASTOVE ISLAND* (Lat. 10° 6' S., Long. 47° 45' E.) is an atoll 22 miles S. by E. from the Cosmoledo group; it is 2 miles long by $1\frac{1}{2}$ miles wide, and is characterised by having a very perfect land rim, which is only divided by one pass. The lagoon, though obviously increasing in size, was probably present before elevation, thus differing from the lagoon of Aldabra. The one pass is apparently of very recent date, for it has no channel, and is almost dry at low water, at which

*J. C. F. Fryer, *Geographical Journal*, September, 1910.

General charts 2762, 597, 748b.

Plan of Astove island on 718. Var. 5° 40' W.

time the lagoon itself has depths of 3 or 4 feet only. There are sand-hills of some height at intervals round the island, those on the eastern and north-eastern parts are the highest, rising about 45 feet above the sea. Near the beach on the western side is a single palm tree, and a similar tree stands near the south-eastern corner of the lagoon. The island is mostly covered with low bush, though strips of thick jungle occur. Astove is considerably more fertile than the previous islands described, and fair crops of maize, tobacco, and vegetables are grown, while a cocoanut plantation gives some promise of success; there is also a certain quantity of guano.

The island is permanently inhabited, and besides agriculture there is fish curing and turtle catching.

The settlement is near the western palm tree; there is a well which yields only brackish water, so the inhabitants are dependent on the rain water collected.

The island is visited occasionally by a small vessel from Seychelles.

The south-eastern point is low and rocky, with breakers extending about 5 cables out, and the water appears green for about a mile in a S.S.E. direction. Along the eastern side, the edge of the shoal is distinctly marked about 2 cables from the beach, where the sea breaks. Off the northern point, the reef skirts the shore a little outside the general direction of the land; on it the sea breaks heavily. On the reef off this point is a large anchor and a gun of ancient make, said to have belonged to a Portuguese man-of-war wrecked here. At other parts, the reef is steep-to and there are no outlying dangers.

Anchorage (*Lat. 10° 6' S., Long. 47° 45' E.*).—During the S.E. monsoon or trade wind, a vessel may hold on to the reef westward of the single palm on the western side of the island by sending a kedge, by boat, to the reef; if a hawser is used it should be buoyed to keep it clear of the coral. During the N.W. monsoon an anchor may be dropped close to the reef on the lee side.

The tide is said to rise 8 or 9 feet at Astove.

Plan of Providence and St. Pierre islands on 724.

PROVIDENCE REEF and ISLANDS.—Providence reef is 24 miles long N. by E. and S. by W., and about 6 miles wide near the centre; besides Providence and Cerf islands, near its northern and southern ends respectively, there are distributed over the reef many sand cays, as well as banks that dry at half tide. At from one to 1½ miles from its western edge there is no bottom with 100 fathoms. The eastern side of the reef has not been examined from seaward, the prevailing south-easterly winds and heavy seas rendering it unapproachable. On that side are several openings, all ending in a

General charts 2762, 597, 748b.

Plan of Providence and St. Pierre islands on 724. Var. 4° 20' W.

cul-de-sac, and no passage, even for a boat, has been found anywhere across the reef at low water.

Wrecks.—The remains of a wreck lie on the western edge of the reef about 2 miles south of the south end of Providence island; only a small portion of it was visible in 1905.

The wreck of a steamer lay (1911) on the East end of Cerf island, with bridge and fore part above water, funnel and two masts standing.

Providence island (*Lat. 9° 14' S., Long. 51° 2' E.*), so named from its having proved the salvation of the crew of the French frigate *Heureuse*, wrecked on this reef in the year 1763, is 2 miles long North and South, by one-third of a mile wide, and stands with its northern end about $1\frac{1}{2}$ miles within the northern part of the reef. It is well wooded, chiefly by cocoanuts, and an avenue of casuarina trees 50 feet above high water traverses the centre of the island from East to West, under the shade of which is the village. The island is under the Seychelles Government, and is owned by a Persian firm from there (Said and Co.). The population consists of the manager and his family, with 13 labourers. The only export is cocoanut oil, and the output is small, as the trees were planted too thickly in the first instance. Turtle are caught between January and March. Fowls and pigs are procurable in small quantities; the drinking water is obtained from wells, and is slightly brackish. The island is visited every four months from Seychelles.

Cerf island, locally known as the South banks, is one of a number of sand cays on the southern part of Providence reef. These sand cays are about 7 feet above high water, and one of them is planted with cocoanut trees, the tops of which were, in 1905, about 35 feet above the sea level, rendering the island visible from a distance of about 10 miles. The remainder of the banks have each a few cassava bushes on them, and creepers; they have recently been planted with cocoanut trees. There are two huts, and a turtle pond on one of the banks, for the use of the labourers collecting nuts and turtling, and there is also a pool of good fresh water close to the western edge of Magnetic island. The banks are not permanently inhabited. There is no coral to be seen in this vicinity, the sand being composed of broken shells only. The bank at the western end of Magnetic island dries out for three-quarters of a mile to the westward at low water, and is formed of sand, having patches of black coloured weed growing on it.

Anchorage.—The most convenient anchorage from which to communicate with Providence island is in 19 fathoms, sand and coral, with the village boat-house bearing S.E. by E., and the North extreme of the island N.E. $\frac{1}{2}$ E.; caution is necessary, as the water shoals very rapidly; this anchorage is free from much swell during the S.E. monsoon, but is exposed to the wind.

General charts 2899, 597, 748b.

Plan of Providence and St. Pierre islands on 724. Var. 4° 20' W.

H.M.S. *Sealark* anchored in this position, but was informed by the manager that a better anchorage could be found, in 12 fathoms, one or two cables to the southward. The most sheltered anchorage is nearly 16 miles southward of this, in 10 fathoms, with the northernmost of the South banks bearing S.E. by S., distant 2 miles; the bottom here is more level and anchoring ground extends farther from the reef. South-easterly winds blow quite nine months of the year, but in January and February, when north-westerly winds are strong at times, it is stated that vessels can anchor eastward of Providence island.

Landing is attended with risk at all times, but in fine weather it can be effected over the fringing reef, with the village bearing E. by S.

During the S.E. monsoon the landing at Cerf island banks is easy at any time at or near high water.

Tides and tidal streams.—It is high water, full and change, at Providence island, at 2h. 45m., springs rise about 8 feet.

At the anchorage off Cerf island banks, indicated above, the tidal stream sets North at the rate of a quarter of a knot to half a knot (at springs possibly more), while the tide is rising by the shore, and S.W. at about the same rate, but irregularly, while the tide is falling. The streams are slack for about an hour at the turn of the tide. At the anchorage off Providence island there is a marked difference in the streams; they are very much stronger, and set North for 9 hours, namely, from 3 hours before high water until the succeeding low water, at a nearly constant rate of $1\frac{1}{2}$ knots (at 5 days after the change of the moon), then slackening and running S.S.W. for about 3 hours at nearly $1\frac{1}{2}$ knots, turning rapidly after that again to the northward.

St. Pierre island (*Lat. 9° 19' S., Long. 50° 43' E.*) lies W. by S. distant 19 miles from Providence island. It is one mile in diameter, and is singular, in these parts, in being formed of raised coral, instead of the usual formation at the sea level. The island is 15 to 30 feet high, and is covered with a dense scrub, chiefly of wild hibiscus and tangerine, the top of which is about 40 feet above water level. There is one coconut tree on the N.W. point of the island.

The island, which belongs to the Seychelles Government, is uninhabited, and is frequented by large numbers of frigate birds, boobies, and other large sea birds in the breeding season (September and October), so that the bare coral surface has become largely phosphatised.

There is no fringing reef, but it is surrounded by abrupt coral cliffs, 8 to 10 feet in height, which have been undercut and worn into "blow-

General charts 2899, 597, 748b.

Plan of Providence and St. Pierre islands on 72½. Var. 4° 20' W.

holes " by the ceaseless swell, which causes jets of water to be thrown up by each wave; flat shelves have also been worn away on the south-east corner.

It is not possible to land except at two small indentations at the northern end, and then only on a fine day and at dead low water, when a small extent of sand is exposed.

Depths of about 300 fathoms are found at a distance of half-a-mile all round the island; it is doubtful if there is any anchorage.

In 1908 machinery was installed which permits of the loading of 300 tons of guano a day.

Tides.—It is high water, full and change, about 3h. 30m.

SHOALS.—**Wizard reef** lies 22 miles N. by E. from Providence island, and is 3 miles long East and West by one mile wide; on the western part three rocks show at low tide, and a depth of 23 fathoms was obtained on the eastern side; otherwise there is deep water close-to all around.

Chart 2899, Chagos archipelago to Madagascar.

In 1886, a resident on the Farquhar islands reported the discovery of a shoal with $4\frac{3}{4}$ fathoms over it, lying about E.S.E. distant 15 miles from Providence island.

Umzinto bank, discovered by the steam vessel of that name in 1896, is in lat. $9^{\circ} 39\frac{1}{2}'$ S., long. $51^{\circ} 18'$ E., and lies 20 miles S.E. by E. $\frac{1}{4}$ E. from Cerf island. The bank is of coral, and about 5 miles in diameter; soundings of from 11 to 13 fathoms were obtained on the bank, and no bottom with 100 fathoms close-to. The position was verified by sighting Cerf island shortly afterwards.

Bank.—A bank on which a depth of 11 fathoms was obtained is reported to lie 13 miles N.N.W. from Farquhar islands, and in a direct line between those islands and the southern end of the Providence reef.

H.M.S. *Sealark* obtained a soundings of 890 fathoms in this position.

McLeod bank was discovered in 1818 by Captain D. McLeod, commanding the vessel *Marquis of Huntly*, bound to Bombay, with the vessel *Duke of York* in company. The bank was sounded over for a distance of 7 miles in a N. by E. direction in a short chopping sea, and the least water obtained was 10 fathoms in lat. $9^{\circ} 57'$ S., long. $50^{\circ} 20'$ E. This bank has not been closely examined. H.M.S. *Pearl* in 1903 had soundings of from 12 to 15 fathoms, sand and coral, for about one mile E.S.E. from a position in latitude $9^{\circ} 59'$ S., longitude $50^{\circ} 22'$ E.; the bottom could be plainly seen, and the edge of the bank was very steep.

General charts 597, 748b.

Plan of Farquhar group on 718. Var. $4^{\circ} 40' W.$

FARQUHAR ISLANDS (Îles Joao de Nova). — This group, which is privately owned in Mauritius, and is under that government, stands on an atoll $11\frac{1}{2}$ miles long N.E. and S.W. by 6 miles wide; the central lagoon being shallow, with numerous dry banks and patches, and is not navigable except for pirogues and small boats. The deep water ends, in a kind of small basin, opposite the settlement, in which the schooner that visits the group anchors; it is not available for any larger vessel. The reef which fringes the group appears tolerably steep except in the north-western part, where a sandbank with from 6 to 12 fathoms over it, plainly visible, extends north-westward $3\frac{1}{2}$ miles. The outer edge of the bank lies W.N.W. nearly 5 miles from the Trois îles; eastward of Trois îles the bank extends from 3 to 8 cables from the reef, and shoals rapidly towards it from 20 to 5 fathoms.

The islands are visible seaward from a distance of about 15 miles.

A magistrate visits the islands occasionally, and there is communication with Mauritius about once in three months.

Produce, &c.—In September, 1907, the population consisted of three Europeans, the manager, an assistant manager, and an accountant; about 100 labourers from Mauritius and the Seychelles, 50 women, and about 40 children.

The industries are chiefly collecting copra and drying fish; there are about 30,000 cocoanut trees bearing fruit on the islands, and many others are planted; a moderate quantity of edible turtle are caught.

The guinea fowl are nearly extinct, but as they are now being preserved, the numbers will probably increase in a few years. Fowls and eggs are plentiful, but there is no water procurable. The health of the natives is excellent, and there is little crime amongst them.

Goelette island (*Lat. $10^{\circ} 12' S.$, Long. $51^{\circ} 9' E.$*), on the south-eastern side, is low and flat, and has a small clump of cocoanut trees, which in 1905 were about 10 feet high, also a small sand-hill; it may be recognised 5 or 6 miles distant. The reef extends nearly $4\frac{1}{2}$ miles W. by S. from Goelette to its south-western extreme; and, from thence, nearly 5 miles N. by W. $\frac{1}{2}$ W. to the shallow break in the reef at its western extreme, forming a boat passage into the lagoon.

South island.—At $1\frac{1}{2}$ miles N.E. by E. $\frac{1}{2}$ E. from Goelette island is the southern end of the large southern island, on the eastern side of the reef, which may be seen from the masthead at a distance of 16 miles. South island is 3 miles long, and has a ridge of sand dunes about 70 feet in height along its entire length, standing on the outer part of the island; there are clumps of cocoanut trees on the flat lagoon side, and also at the northern end. Manaha hill, at the north-eastern end, is 50 feet high.

General charts 2899, 597, 748b.

Plan of Farquhar group on 718. Var. 4° 40' W.

Manaha is a group of three small islets, low, flat, and covered with scrub, standing between South and North island.

North island, on which the settlement (Grande Poste) is placed, is of the usual atoll island description, flat, and not more than 10 feet high except in two places, namely, at the settlement, where there is a sand dune of about 40 feet, on which the manager's house stands, and another similar sand elevation of about 20 feet at the northern corner. North point is bordered by a reef which extends 2 cables northward and 7 cables westward. From North point the coastline turns suddenly south-westward for $1\frac{1}{2}$ miles to Race point at the entrance of the small basin.

Trois îles are the only other islets on the reef, and they lie towards the north-western extreme. The western and largest is inhabited by natives who catch turtle in the season, and is, on that account, called Île des Déposés; it has a conspicuous single cocoanut tree in the centre. The next islet is named Île du Milieu, and the easternmost is Île Lapin; both are quite small and covered with scrub.

The three sand islets, formerly in this vicinity, have disappeared.

Wrecks.—In 1905, the wrecks of two large steamers were on the edge of the reef; that of the *Hardwick Hall*, which was wrecked in 1902, at the south point, and that of the *Aymestry*, wrecked in 1897, off the north-west side; the latter vessel was driven ashore during a south-westerly gale of a cyclonic description. Both wrecks form excellent marks for navigation, and are likely to remain in position for some years. A third wrecked steamer, with masts and funnel still standing in 1911, lies on the western end of the reef.

Anchorage (*Lat. 10° 9' S., Long. 51° 8' E.*).—There is good anchorage on the bank off the entrance of the Inner harbour channel, except during the cyclone season, December to April inclusive. The best berth is in 7 fathoms, sand, with Race point bearing South, and the North extreme of North island E. $\frac{1}{2}$ N. Little or no swell is felt at this anchorage, though the sea may be heavy outside.

Inner harbour.—The entrance to the lagoon or Inner harbour is at the north-western side of North island. The harbour is small, and, except in cases of emergency, practically useless for vessels drawing more than 10 feet, on account of the narrow crooked entrance and the rapidity of the tidal streams. Probably the least water in the channel is $3\frac{1}{2}$ fathoms at low water and $4\frac{1}{2}$ fathoms at high water; but there are numerous coral heads on which the depth may possibly be less.

Directions.—When approaching the anchorage from the eastward, North point should be rounded at a distance of one mile; when the flagstaff at Turtle hill, Grande Poste, bears eastward of S. by E. steer towards Race point: the water will then shoal very rapidly up to

General charts 2899, 597, 748b.

Plan of Farquhar group on 718. Var. $4^{\circ} 40'$ W.

the anchorage described. Boats proceeding from the anchorage to the settlement should give the North-western side of Race point a good berth, but pass close to its south-western extreme. It is not advisable to approach these islands at night, nor from the westward except in clear weather.

Tides.—It is high water, full and change, at the Farquhar islands, at 4 hours; springs rise 7 feet, neaps 5 feet.

Tidal streams.—At the anchorage the tidal stream runs N.E. for 9 hours; namely, during the rising tide and until 3 hours after high water by the shore; the rate at springs is from a quarter of a knot to $1\frac{1}{4}$ knots; they run to the westward at the rate of about half a knot, or are slack for the remaining 3 hours before low water.

Current.—Between Cape Amber and the Farquhar islands a northerly set of 22 miles in 16 hours was experienced in March.

Winds.—South-easterly winds prevail from April to October; during the remainder of the year the winds are variable. The islands are bordering on the cyclonic area, but the only cyclone of which there is any knowledge or information took place in the year 1889.

Chart 2899, Chagos archipelago to Madagascar.

Rajaswaree shoal.—This reported danger, on which heavy breakers were said to have been seen from a vessel of that name in 1858, but no soundings taken, was considered to lie in about lat. $11^{\circ} 25'$ S., long. $52^{\circ} 2'$ E.; but as nothing was seen of it by H.M.S. *Philomel* when searching for it in 1876, nor by H.M.S. *Cossack* when passing over the assigned portion of the shoal in 1894, nor by any other vessel before or since that date, it may be conjectured that a tide ripple was mistaken for breakers. Nevertheless, the shoal remains on the chart, and a careful lookout should be kept when in the locality.

The ss. *Congella* passed over this reported position in 1905, no breakers or shoal water were observed, but there were numerous tide rips.

Chart 2762, Comoro islands, &c.

THE COMORO ISLANDS.—GENERAL REMARKS.

—The Comoro islands are four in number, of which Mayotta has been a French colony since 1844; the other three, formerly a French protectorate, were annexed to France by a decree dated the 23rd January, 1896. They lie nearly midway between the North extreme of Madagascar and the African coast, Comoro, the largest and highest of the four, giving its name to the group; the others are Johanna, Mohilla, and Mayotta, all of which are high and of volcanic origin. These islands, except Mayotta, are generally safe to approach, with clear passages between them; but Mayotta is the only one that affords secure anchorage at all times.

General charts 2899, 597, 748b.

Chart 2762, Comoro islands, &c.

Area.—Population.—Language.—Comoro island has a superficial area of about 425 square miles and a population of 57,766. Johanna, an area of 146 square miles and 25,500 inhabitants. Mohilla, an area of 89 square miles and 4,450 inhabitants. Mayotta is about the same size as Johanna and has a population of 10,000. The population of all the islands is very mixed, but chiefly Africans, Malagaches, and Indians, with a few Arabs, and still less Europeans. Swahili and English are the languages chiefly spoken.

Government.—By a decree of 9th April, 1908, the Comoro islands were attached to the General Government of Madagascar, maintaining their administration and official autonomy.

An Administrator-in-Chief is charged, under the authority of the Governor-General of Madagascar, with the administration of the colony. The islands forming the protectorate are administered by functionaries delegated by the Administrator-in-Chief, under his authority. There is a council, on which the protectorates are represented. The sultans have no part in the administration.

The regulations for entering the harbours of French possessions in time of war will be found in Appendix V.

Currency, &c.—The money in use is the French 5 franc piece, divided into 2, 4, 8, or 10 bits, called “Toumonis.” Weights and measures are the same as those used in France.

Winds.—The prevailing winds at the Comoro islands are the North-east and South-west monsoons, the latter varying so much between S.W. and S.E. as to be also known as the South-east trade wind.

The North-east monsoon, beginning at the end of October or early in November, lasts until April, and is the period of greatest heat and the rainy season. During this period the wind is variable and irregular, with frequent squalls. During the South-west monsoon, or South-east trade, on the contrary, it is more regular, blowing as a rule softly, though occasionally fresh, from the south-eastward by day, especially during the month of July, and shifting to South-west at night. There are occasional showers during this season.

The change of the monsoons is marked by calms, variable winds, and squalls of wind and rain of short duration. It must be borne in mind that cyclones from the Indian ocean sometimes pass into the Mozambique channel, and occasionally reach the Comoro islands, which suffered considerable damage from cyclones in 1898 and 1904; seamen, therefore, should be on their guard, especially during February, March, and April. *See* also winds at Johanna, page 202.

Current.—The current between St. Lazarus bank and the Comoro islands averages about $1\frac{1}{2}$ knots in a westerly direction; a little north-westward of the Comoro group, in December, it has been found setting

General charts 597, 748a, b.

Chart 2762, Comoro islands, &c.

nearly due West at from 2 to 3 knots. In the vicinity of Mayotta island the current is very variable, this island appearing to lie southward of the general westerly stream which flows past Johanna. Between Mayotta and Johanna the current is generally south-westward, but at times sets south-eastward with considerable strength. About the southern end of Mayotta, an easterly current is common.

Climate.—The Comoro islands, with the exception of Mayotta, may be considered fairly healthy. The dry season is from May to November, the rainy season from November to March and even to May; the mountains probably throw down the rain at all seasons on the weather side; at Pomoni, on the southern side of Johanna, the rain is incessant in May. Gales are also frequent and severe during the rainy season. See also remarks on climate in the descriptions of the different islands.

Communication.—The Messageries Maritimes mail steamers between Marseilles, Mauritius, and Réunion leave Marseilles on the 10th of each month, and call at Mayotta *en route* and on the return voyage; these steamers also call at ports in Madagascar. The monthly service of steamers between Diego Suarez and Zanzibar calls at Mayotta, Mutsamudu, Mohilla, and Moroni both ways, and the German East African Company's steamers call if assured of sufficient freight. Many dhows trading between Madagascar, Mozambique, and Zanzibar, also touch at Mayotta. Mayotta is in communication with Majunga by means of wireless telegraphy, and messages are passed from Mayotta to Johanna and the other islands by flashing signals. See also pages 24, 25.

Plan of Comoro island on 563.

COMORO ISLAND OR GRAND COMORO, the northernmost as well as the largest and highest island of the group, is about 35 miles long North and South, and 12 miles wide. The principal anchorages are Moroni and Itsandha, on the western coast. The French Resident has his official station at Moroni. Streams or brooks are rare, but the natural humidity is sufficient to cause a luxuriant vegetation. The vicinity of every village is cultivated with coconut trees, and the valleys are rich with trees and other growth, except where lava streams have rendered them desolate. The island is remarkably healthy, sickness being scarcely known. The population of Grand Comoro, in 1910, was 57,766, of whom 50 were Europeans or Creoles.

The summit of Mount Kartala, 7,874 feet in height and the highest part of the island, the whole of which is volcanic, is about 12 miles from its southern extreme and 6 miles distant from both eastern and western shores. The summit is a crater, but the mountain appears to the observer from a distance smooth and dome-shaped, rising so evenly from the sea on its southern side as to give a deceptive idea of its

General charts 2762, 597, 748a, b.

Plan of Comoro island on 563. Var. 7° 10' W.

height when close-to; in clear weather, it may be seen more than 100 miles distant. The first recorded eruption occurred about the year 1830; there was another in 1855, during which lava issued from several old craters, and also on the more eastern part of the island; it then produced a great disturbance and turbulence in the sea, driving several dhows on shore, and casting a great quantity of fish upon the coasts. Another eruption took place in 1858, on which occasion lava flowed out of the side of the mountain into the sea on the West coast between the towns of Moroni and Itsandha, which, being only 3 miles apart, narrowly escaped destruction. In 1861, the lasting effects of this eruption were apparent; all trace of vegetation was destroyed where the stream of lava had passed, and a projecting black point of lava, which previously had no existence, had been formed about a mile northward of Moroni. On the 1st March, 1883, when off the southern point of the island, H.M.S. *Undine* observed an eruption break out which lasted three days; lava was noticed running down the mountains in red-hot streams, and immense clouds of scorix filled the air. On February 25th, 1904, a fresh eruption commenced, and on March 3rd it was reported that lava was being ejected from three distinct craters about 1,000 yards distant from each other.

At the south-western point of Comoro, ignited sulphurous vapours are said frequently to issue from crevices in the ground, showing as lights at night to vessels when passing close in-shore.

North coast.—Ras Baku (*Lat. 11° 21' S., Long. 43° 22' E.*) is the central northern point of Comoro. All the northern coast is low, but rises suddenly within to a plain some 2,500 feet above the sea level, topped by numerous mountain peaks and craters from 3,000 to 3,500 feet high. A reef, partly dry at low water, is said to extend 7 or 8 cables off the north-western point of the island, but this is very doubtful. The northern coast is fringed by a reef about 2 cables wide.

Plan of Mtamuhuli on 2066.

Mtamuhuli.—Anchorage.—The town of Mtamuhuli, fronted by a sand-beach, lies close to the north-western point, and is next in size and importance to Moroni and Itsandha. A sand-flat with less than one fathom fronts the coast to a distance of about 3 cables. There is indifferent anchorage in about 30 fathoms at $2\frac{1}{2}$ cables off the flat, with the flagstaff bearing E. by S. $\frac{1}{2}$ S., distant $1\frac{1}{10}$ miles; the anchorage is bad on account of the great depth of water and the tide rips to which it is subject. There is much less water in the direction of North point, but probably the bottom is foul there. A plentiful supply of good water is said to be here obtainable, and landing is easily effected at three-quarters flood, on the sandy beach abreast of the town.

Tides.—Springs rise about 11 feet, and the time of high water at full and change is probably about the same as at Moroni, viz., 4h. 53m.

General charts 2762, 597, 748a, b.

Plan of Comoro island on 563. Var. $7^{\circ} 10' W$.

About 2 miles eastward of Ras Baku is Ras Habu, a rocky promontory 250 feet high, joined to the coast by a low neck; the town of Bangúa is near it.

East coast.—The eastern coast of Comoro island is nearly straight, but curves in slightly to the westward, and the water is apparently everywhere deep. The mountain ridge slopes to the water's edge with but little level land, and there are several lava streams; with the following exception, this coast would appear to be quite inaccessible. Near the north-eastern extreme of the island, possibly within the reef extending off Tortues island (*Lat. $11^{\circ} 25' S$, Long. $43^{\circ} 28' E$*), there is said to be a small harbour where dhows lie in safety even during the North-east monsoon.

About $11\frac{1}{2}$ miles northward from the south-eastern point of the island, there is a table-topped hill, 1,640 feet high, on the eastern coast, and a lava cliff $4\frac{1}{2}$ miles northward of it. At 2 miles north-westward of the south-eastern point is Mbajini, a walled town, said to be one of the largest in the island.

The south-eastern point is low, with a cone-shaped crater near its extreme and a mosque at Mahalé northward of it. The point is here bordered by a narrow reef, and further to the southward, off Shindini, there is a depth of 30 fathoms $1\frac{1}{2}$ miles from the coast and ocean depths just beyond. A short distance inland are sharp cone-shaped peaks rising from the southern spur of Mount Kartala.

South coast.—The southern coast of Comoro is also low, with flat land within, the hills beginning to rise at $1\frac{1}{2}$ miles from the coast. It is rocky and steep westward of Shindini, and the country vessels frequently sail along within hailing distance of the shore. At the south-western point, which bears N.W. $\frac{3}{4}$ W. distant 12 miles from the South point, the land rises rapidly from the water's edge, without a break, to the summit of Mount Kartala. A considerable bay is formed between the two points.

Plan of Shindini on 2066.

Shindini.—Anchorage.—At 2 miles south-westward of the south-eastern point of Comoro island is the village of Shindini; dhows find anchorage here inside the reef fronting it; the passage through the reef is narrow and a little southward of the village. There is a $3\frac{1}{4}$ -fathoms shoal, steep-to, in the outer anchorage, with the white house in the village bearing N.W. $\frac{3}{4}$ W., distant nearly 6 cables; the anchorage is in about 18 fathoms, south-westward of the shoal, at about 2 cables off the coast reef, and with from 30 to 40 fathoms at 2 cables outside it.

Tides.—The time of high water at full and change is probably about the same as at Moroni, viz., 4h. 53m. Springs rise 11 feet.

General charts 2762, 597, 748a, b.

Plan of Comoro island on 563. Var. 7° 20' W.

West coast.—This coast is said to be bold of approach, except for Vailheu shoal, presently mentioned, and to have no anchorages, except Moroni and Itsandha; there are several villages along it.

Mantzeza hill, better known as Round hill, about 2 miles southward of Iconi, is remarkable; it is about 700 feet high, and presents a bluff face to seaward. The village of Mantzeza is on the south-eastern slope of the hill. When seen from the westward, this hill alters its aspect; it then appears to be oblong, with small ravines from top to base, as if it had been ploughed.

Sunken rocks extend about $3\frac{1}{2}$ cables from the coast at one mile southward of Mantzeza hill; from thence, a reef of about the same width fringes the coast northward to Iconi, and of a less width as far northward as Moroni.

Iconi hill, seen from the southward, appears like a saddle; when seen from the westward, it presents two peaks with a deep hollow between them; the ruins of a white stone building are on the apex of the northern peak. Just southward of and under the hill is the town of Iconi.

Northward to Moroni, the coast is low. Between Moroni and Itsandha, a distance of $2\frac{1}{2}$ miles, the coast is rocky and steep-to, and about a mile northward of Moroni a low black point projects, forming the northern extreme of Moroni bay; this point was produced by the eruption of 1858, as previously described. About one mile northward of Itsandha, a large walled town will be seen some way up the side of the mountain. For the coast from Itsandha northward, *see* the chart.

Vailheu shoal (*Lat. 11° 47' S., Long. 43° 3' E.*) is about 12 miles W. $\frac{1}{2}$ S. from Mantzeza hill. It is about one mile in extent, steep-to, and reported to dry in places at extreme low tides. Depths of from 4 to 10 fathoms surround the shoal in most places to a distance of about 5 cables. It does not always break in calm weather, but the water over it is of a light green colour, and it may be discerned at some distance from aloft, with the sun in a favourable position.

When near the parallel of the South end of Comoro, at night, vessels should keep westward of the meridian of 43° E., in order to avoid the Vailheu shoal.

Plan of Moroni anchorage on 2762.

MORONI BAY, on the western coast of Comoro island, is about 5 cables wide, and recedes about $2\frac{1}{2}$ cables, but the whole space is occupied by a shallow flat of coral and sand with from 6 to 12 feet water at its edge, steep-to, and extending out to about the line of its entrance points.

Beacon.—Abreast of the northern end of Moroni town lies Suadzu islet, connected with the coast at low water. An iron pole beacon surmounted by an iron globe-shaped cage, painted white, stands on a

General charts 2762, 597, 748a, b.

Plan of Moroni anchorage on 2762. Var. 7° 20' W.

square base of masonry on Suadzu islet. This beacon in line with the white tower of Gérézani and with the Residency flagstaff S. 57° E. leads in to the anchorage.

Harbour lights (*Lat. 11° 42' S., Long. 43° 15' E.*).—Three small *fixed lights*, not visible from a distance of more than 3 miles, are exhibited when a vessel is expected at the anchorage; viz., a *white* light at Biladi, the south-western point of the bay; a *red* light on Suadzu islet beacon; and a *white* light from the white tower at Gérézani, at the back of the town.

The *white* light at Biladi will eventually be replaced by a *green* light.

Anchorage.—Abreast of Suadzu, on the leading line just now given, with Iconi hill bluff just open westward of the trees of the South point of Moroni bay, there is a depth of 12 fathoms at about 120 yards from the edge of the shore flat, and there are from 12 to 18 fathoms at 1½ cables off the edge of the flat. This anchorage is protected from the violence of the southerly wind and swell by Iconi hill, but it is too close to the rocks for a sailing vessel to get out, if the wind comes in from the westward; and in the North-east monsoon it is worse. Vessels should proceed very slowly up to this anchorage, as the depths decrease so rapidly; strangers will do well to send a boat in previously to find a berth and to anchor as a guide to it.

Dhows pass to the head of the bay at high water and lie aground; there is good landing here.

Moroni town stands at the head of the cove, and is surrounded by a wall; it is chiefly composed of detached huts with narrow streets, but there are several substantial stone buildings. The Residency, the headquarters of the French Resident, is about 700 yards inland to the eastward.

Communication.—The steamer from Diego Suarez to Zanzibar calls here on the 21st or 22nd of each month, and on the 29th of each month returning; Grand Comoro is in connection with the other islands by means of flashing signals.

Supplies are cheap and plentiful, especially cattle, which are exported to the other Comoro islands. Water, however, is scarce, and is said to be so almost throughout the island.

Tides.—It is high water, full and change, at Moroni at 4h. 53m.; springs rise 10 feet.

Plan of Comoro island on 563.

Itsandha bay and town are about 3 miles northward of Moroni, the two bays being somewhat similar. The anchorage, like that of Moroni, is very indifferent, being deep, but close to shallow water; vessels should not anchor in less than 20 or 25 fathoms, which depth will be found about midway between the extreme points of the bay.

General charts 2762, 597, 748a, b.

Plan of Comoro island on 563. Var. 7° 20' W.

There is good landing at the head of Itsandha cove near a tree whose stem is of enormous size.

Itsandha is walled in like Moroni, and is about the same size. There is a village northward of the town, and a well at the North extreme of the bay, at the head of a small inlet.

Plan of Mohilla island on 563.

MOHILLA or MOHELI ISLAND.—Mohilla is the smallest, and, though rising to a height of 2,950 feet, is, with the exception of Mayotta, the lowest of the Comoro islands; it is about 16 miles long N.W. and S.E. by 9 miles maximum width; some small islands lie about 3 miles from its southern coast. The island is well wooded, being covered with trees to the summit. On the north-eastern side, the land is low near the sea, rising gently to the mountainous central ridge, which has no peaks and appears capable of cultivation to its summit. The natives are a peacefully disposed people, very similar to those of Johanna. The population of Mohilla in 1910 was 4,450, of whom 44 were Europeans.

The island is very fertile, but its fertility and dampness of soil render it unhealthy for Europeans. The principal products are vanilla and coconuts, coffee is only grown in small quantities for the use of the inhabitants. Cattle are good and cheap.

Fumboni, on the north-eastern side, is the principal town, and the seat of the French Resident.

Muchaco islet, or White rock, lies about $4\frac{1}{2}$ miles eastward of the south-eastern end of Mohilla; it is 98 feet high, flat-topped, and with steep sides, except the western side. There is a good channel with from 10 to 12 fathoms between it and Mianga islet 2 miles to the westward. Two other small islets, Samia and Miangoni, lie between Mianga and the Mohilla coast.

The East coast of Mohilla forms a slight outward curve, with depths of from 8 to 14 fathoms at one or $1\frac{1}{2}$ miles off-shore and from 14 to 17 fathoms at $1\frac{1}{2}$ or 2 miles; it appears to have anchorage everywhere at these distances, but it should not be approached within one mile.

Table bluff or Square top, about midway between the south-eastern point and Fumboni, is steep-to, with good anchorage close northward of it.

Plan of Fumboni bay and road on 2066.

FUMBONI (Fomboni) BAY (*Lat.* $12^{\circ} 16' S.$, *Long.* $43^{\circ} 45' E.$).—In this bay is the walled town of Fumboni, the principal town of Mohilla; it lies $5\frac{1}{2}$ miles south-eastward of the North point of the island. The shore of the bay abreast of the town is fronted by a reef to a distance of 6 cables, with detached rocks and shallow water for

General charts 2762, 597, 748a, b.

Plan of Fumboni bay and road on 2066. Var. 7° 20' W.

about one cable beyond; two breaks in the reef afford shelter for small craft—Duéni cove, in front of the Sultan's residence, and Tsoa cove, the easternmost and largest, where there is good landing.

Fumboni is a brown dull-looking town close to the beach in the western part of Fumboni bay; on the sea face it is defended by a solid platform and rampart designed to receive a battery. The Sultan's residence is near the centre of the town. Near the north-western corner of the town, facing the beach, is a sugar factory with white chimney; the house of the manager, with a square tower and flagstaff, adjoins it. These are conspicuous from seaward, having the appearance of a casemated barrack. The factory has not worked since 1902. The place is not particularly healthy.

The anchorage (*Lat. 12° 16' S., Long. 43° 45' E.*) off Fumboni is good during the South-west monsoon, although at times there is more swell than would be expected under the lee of the island; during the North-east monsoon there is considerable swell, and being a lee shore it is not safe.

A 4½-fathoms shoal lies with the Sultan's flagstaff bearing S. 42° W., distant 1½ miles. The flagstaff bearing S. 38° W. leads in westward of the shoal towards the anchor marked on the chart to anchorage in from 7 to 8 fathoms, at 1½ or 2 cables outside the 5-fathoms line, and about 9 cables from the flagstaff. The anchorage is considered good in these depths, but large vessels are recommended not to go into less than 9 fathoms. The anchorage should be approached with caution.

Duéni cove is a dhow harbour formed in the coral reefs. The entrance is narrow and the cove itself scarcely 300 yards long in a S.W. by S. direction. The Sultan's flagstaff bearing S. 32° W. apparently leads in clear. Inside, there is not room for anything larger than dhows to swing.

There is a landing place in this cove; it is inconvenient at low water, as the sandy shallows then stretch out so far that boats cannot approach within 250 yards of the dry beach. When there is much surf on the reef, the entrance to the cove shows plainly, but if only breaking occasionally some care is necessary to avoid missing the entrance.

The best landing and the best anchorage apparently for small craft in the South-west monsoon is in Tsoa cove, a mile farther south-eastward; this inlet, according to the plan, is about 2 cables in extent, with a depth of at least 4 fathoms.

Communication.—The steamer from Diego Suarez to Zanzibar calls here on the 20th and 21st of each month, and on the 29th of each month returning. Mohilla is in connection with the other islands by means of flashing signals.

Tides and tidal streams.—It is high water, full and change, at Duéni cove at 4h. 30m.; springs rise 13 feet. Along the North coast

General charts 2762, 597, 748a, b.

Plan of Mohilla island on 563. Var. $7^{\circ} 20'$ W.

of the island the main part of the flood stream runs westward, but it changes to the eastward before high water on the shore; as does the ebb stream to the flood before low water on the shore.

North and west coasts.—Between Fumboni bay and Pointe Oani, the northern extreme of Mohilla, the coast is said to be skirted by a reef, with a boat passage inside it, but very little is known of this part. About one mile south-westward of Pointe Oani is a black rock close inshore and always above water, with 12 fathoms water about one mile north-westward of it. Chiconi rocks (*Lat. $12^{\circ} 17'$ S., Long. $45^{\circ} 39'$ E.*), under water, lie about $1\frac{1}{2}$ miles south-westward of the black rock, and there is a rock farther from the coast and above water off Miringoni, the next point to the southward.

Anchorage.—There is anchorage on the bank fronting the shore between Fumboni bay and Pointe Oani abreast of Batsé village, and also westward of Pointe Oani, abreast of Domoni village. The depths at these anchorages are tolerably regular, from 8 to 14 fathoms at $1\frac{1}{2}$ miles from the shore. There appears to be a good watering place at or near Domoni, available for boats; the stream is in a ravine about 200 feet above the beach, by an easy ascent. Boats can land near it between half flood and half ebb.

From Miringoni the western coast forms a bight, in which lies Luaia islet close to the coast and near a village of the same name; from thence to the south-western extreme of Mohilla, a reef, steep-to, fringes the coast to a distance of 5 cables in places. There is said to be anchorage off any of the villages on this coast at from one to $1\frac{1}{2}$ miles from the coast, and, during the South-west monsoon, there is a well-sheltered anchorage about one mile westward of the Mionconi river entrance. Just southward of this anchorage, on the coast reef, is a remarkable black rock covered with bush.

SOUTH COAST.—Islets and dangers.—Off the western part of the southern coast of Mohilla lies a chain of volcanic islands from 2 to 3 miles off-shore, with depths between and within them of from 9 to 15 and 30 fathoms, sand and shells. They are named Mag-nuni, Kanzuni and Maussi (which two are connected), Chumadini, Sanzi, and Mbuhu; Moa and Foro are islets detached from the others and lying close to the coast reefs. Moa is very small, but high and conical with a flat top; Foro, $1\frac{1}{4}$ miles farther eastward, is still smaller, but high and rugged.

The northern, north-eastern, and a part of the western sides of Chumadini, and the northern end of Sanzi, have fringing reefs; off the southern end of Sanzi is an islet steep-to and perforated with round holes. Mbuhu has a rock near its southern point, which covers at high water. A vessel passing in either direction about a mile southward of

General charts 2762, 597, 748a, b.

Plan of Mohilla island on 563. Var. $7^{\circ} 20' W$.

the line of these outlying islands will find only about $6\frac{1}{2}$ fathoms until past them.

A large bank of stones and gravel, with from $4\frac{3}{4}$ to $6\frac{1}{2}$ fathoms, lies about 3 miles eastward of Sanzi island.

A rock with 4 feet over it, and situated about 3 cables from the coast reef, lies north-eastward a distance of about one mile from the before-mentioned bank. It is S. 56° E. a distance of $4\frac{2}{10}$ miles from Numa Choa town.

A depth of 15 fathoms is charted $2\frac{1}{4}$ miles N.W. by W. from Mag-nuni island. H.M.S. *Undine* anchored in 18 fathoms on this bank, with the West extreme of Mohilla bearing N. by E. $\frac{3}{4}$ E., and the South extreme of Kanzuni island S.E. by E. $\frac{1}{4}$ E. On weighing the following morning, soundings of from 16 to 10 fathoms were obtained and carried to an anchorage off Chumadini.

Sail rocks (*Lat. $12^{\circ} 24' S.$, Long. $43^{\circ} 41' E.$*), about 2 cables from the coast, with perpendicular sides, and possibly 50 feet in height, being visible about 10 miles, stand on the reef which extends one mile southward of the south-western point of Mohilla; Numa Choa and the bight eastward is fronted by a reef of similar extent. Flat rocks, entirely covered at high water, lie from 5 to 8 cables off the coast, which is fringed by a reef 3 cables wide in places. Eastward of and including Foro island, the coast is fringed by a reef $1\frac{1}{2}$ miles wide.

Miremani bay lies 6 cables eastward of the south-western point of Mohilla. This inlet between the fringing reefs is about 8 cables long in a N. by E. direction, by $2\frac{1}{2}$ cables wide, and is said to afford well-sheltered anchorage in from 10 to 20 fathoms, sand and mud, being protected on each side by coral reefs extending from 4 to 6 cables off-shore. The western reef is that on which are the two Sail rocks just described; and to the eastward, separated from the coast reef on that side, are the Flat rocks.

Numa Choa harbour, on the southern side of Mohilla and 4 miles eastward of Miremani bay, is a bight in the coral reef fronting the bay south-eastward of the town of Numa Choa. It is about 2 cables wide, with from 6 to 10 fathoms, partly protected to the south-eastward by Moa island, which lies off its entrance, and to the south-westward by the other islands; a swell sets in with south-easterly winds, but there is not much danger of dragging.

During the North-east monsoon it affords perfect shelter. At this time it is frequently crowded by dhows trading between Zanzibar and Madagascar; but in the South-west monsoon many dhows make Fum-boni their port of call. A good berth for anchoring is in about 10 fathoms, sand and mud, with Numa Choa point N.W. by W. $\frac{3}{4}$ W., and the extremes of Moa islet South and S.S.E.

General charts 2762, 597, 748a, b.

DIRECTIONS.

Plan of Mohilla island on 563. Var. 7° 20' W.

Directions.—Approaching from the westward, run in with the South extreme of Foro islet in line with the North extreme of Moa islet; this leads between Mohilla and its outlying islands. Foro islet, which is surrounded by a coral reef, may be known by a peculiar rent near its southern end, whilst the North point has the form of a pillar. Moa should apparently be passed at about 2 cables or less to avoid the reef extending from Numa Choa point. After passing Moa, the high red cliff at Numa Choa point will be observed; bring the bluff western end of the cliff, which has some large mango trees on a sandy beach below it, to bear N.W. by W. $\frac{1}{4}$ W., and this will lead into the harbour.

With the bluff on this bearing, a peaked hill about one mile eastward of Miremani bay is just open of the bluff; this hill must not be shut in until Mbuhi island is well open of Sanzi island, when the course can be altered to the northward and the anchor let go in from 8 to 10 fathoms. No bottom will probably be found with the hand-lead until near the entrance to the harbour.

The reef around the harbour is steep-to, mostly uncovered at low water, and, when covered, can generally be seen from aloft.

Approaching from the eastward, if bound to Numa Choa (*Lat. 12° 24' S., Long. 43° 44' E.*), give the south-eastern end of Mohilla a berth of 2 or 3 miles, and follow the South coast until Sail rocks are well open southward of Moa islet N. 62° W. This mark leads southward of the 4-foot rock, but close to the northern end of the $4\frac{1}{2}$ -fathoms bank; when Foro islet bears North, steer midway between it and Moa; from thence, Numa Choa red cliff bearing N.W. by W. $\frac{1}{4}$ W. leads to the anchorage as before.

A good leading mark is reported to be the North end of Moa in line with a hill eastward of Numa Choa bearing N. 51° W.; this leads between the shoals in not less than 8 fathoms, but the marks should be recognised most clearly before it can be recommended.

Numa Choa, just westward of the red cliffs, is a walled town of considerable size, fronted by a sandy beach. The principal trade is in cocoanuts, which are sent to Madagascar. The natives appear to be good artificers, and it is the common practice for dhows from Comoro and Johanna to be sent here for repairs.

Water.—Repairs, &c.—There are several convenient watering places on the southern side of Mohilla; one is at the head of Numa Choa harbour. The beach on Moa island is very convenient for hauling up or repairing boats, &c.; fair seining can be had here, and men can bathe with safety, as there are no sharks.

Tides.—Springs rise about 14 feet.

Plan of Johanna island on 563.

JOHANNA or ANJOUAN ISLAND.—Johanna is next to Comoro in size and height, but far surpasses it in beauty and fertility;

General charts 2762, 597, 748a, b.

Plan of Johanna island on 563. Var. 7° 10' W.

in form it is triangular, each side averaging about 20 miles in length; the eastern side trends nearly North and South, and the north-western side forms a deep bay where stands Mutsamudu, the principal town, or Johanna as it was formerly called. This island, as seen from the westward, is a succession of peaks rising one behind the other; all are wooded to the top. When first seen from the eastward, about 50 miles distant, it makes as two peaks.

The French Resident resides at Mutsamudu, and a Sultan also resides there, who receives a pension from the French Government but has no part in the administration of the island. The natives are hospitable and well disposed; they are mostly of Arab origin, but the lower orders are much intermixed with the Africa race; the Swahili language is fairly understood here. The principal products are vanilla, sugar, cocoanut, and coffee. In 1909 the total value of imports was £21,115, and exports £33,192. The population in 1910 was 25,500, of whom 200 were Europeans.

Climate.—The climate of Johanna is on the whole healthy, the shores being nearly everywhere free from mangrove swamps. In former times, British cruisers considered this island a sanatorium as compared with other parts of the East African station.

Johanna peak (*Lat. 12° 12' S., Long. 44° 19' E.*), rising near the centre of the island to a height of 5,250 feet above the sea, is of conical form, and nearly a thousand feet higher than any of the others; except in the early morning it is rarely to be seen, being at other times generally obscured by clouds. From the peak, three main spurs extend, forming a rough and mountainous backbone to each of the promontories of the island. Like the other islands, Johanna is volcanic, but not actively so at present; traces of former eruptions are very distinct close outside the town of Mutsamudu, where vast accumulations of cinder may be observed cropping out on the roadside.

There is a lake in the mountains at the back of Pomoni, many feet above the sea, probably the crater of an extinct volcano.

North coast.—A reef extends about 3 cables off the North point and adjacent north-eastern coast of Johanna, outside of which the depths are regular; tide rips extend some distance beyond the reef, so that it is advisable to give the point a good berth in rounding.

Between the North point, and Saddle island off the West point, a distance of 17 miles, is the deep bay in which stands the town of Mutsamudu. For about 5 miles eastward of Saddle island, the coast is fringed by a reef extending nearly 5 cables off-shore in places: the green line of reef shows at high water, and at about half tide the reef breaks everywhere, except with very smooth water. There is a rock

Plan of Johanna island on 563. Var. 7° 10' W.

above water half a mile off-shore, and the same distance eastward of Afombani.

Depths.—From the head of the bay, the depths increase regularly but rapidly from the shore to 20 fathoms, and then to 40 fathoms at only 5 cables from the shore and to 350 fathoms, soft black mud, at one mile. All round the bay and close outside the fringing reef in the western part, no bottom will be obtained with the hand lead at 5 cables off-shore.

Plan of Mutsamudu and Patsi roads on 2066.

Patsi or Oani road (*Lat. 12° 6' S., Long. 44° 26' E.*), formerly known as Stangini bay, is separated from Mutsamudu road by Mirondsi point. It is fronted by a reef, dry at low water, extending from one cable off the northern shore of the bay to about 2 cables off the southern shore, with from 7 to 10 fathoms at a cable outside it.

Near the middle of the bay, a narrow point extends about 300 yards beyond the general line of coast, and nearly to the edge of the reef. On it is a house or store with a flagstaff, and a small landing jetty on the northern side of the point; the place is named Patsi. The town of Oani, in which there is a minaret, is half a mile northward of it.

Beacons.—Anchorage.—Two conspicuous white beacons, surmounted by cages, a little southward of Patsi, when kept in line bearing S. 76° E., lead in to anchorage in about 20 fathoms, coral and sand, at nearly 3 cables from the shore reef, with Oani point N.E. $\frac{3}{4}$ N. distant $2\frac{1}{2}$ cables. Small craft might get nearer the reef here as there is a bight in it.

H.M.S. *Undine* was at anchor here in June, 1883; during this time the water was smooth, though occasionally a swell set in, but not sufficient to cause any uneasiness. Supplies are obtainable, and the beach is a good place to haul up boats under shelter of the trees.

MUTSAMUDU or JOHANNA.—This town lies about 2 miles south-westward of Patsi road, and westward of Mirondsi point. The town, in rather ruinous condition, stands on low ground close to the sea. It is built of stone, with narrow winding streets, and is surrounded by a wall; it is overlooked by a dilapidated citadel, with flagstaff, on a height immediately in the rear; there is another flagstaff, on which the French flag is always hoisted, over the Custom-house at the south-western corner of the town; and another over the Tribunal near the centre of the town, south-westward of the minaret. Government house or the Residency, a building with a tile roof and a flagstaff, is well out of the town, about $1\frac{1}{2}$ miles from the landing place, on the Homba plateau, to which the ascent is very steep. The Hospital, a white building, is considerably

Plan of Mutsamudu and Patsi roads on 2066. Var. 7° 10' W.

below the Residency, but on the same road from the town, as are most of the public offices.

Winds.—The North-east monsoon reaches Johanna about a fortnight later than Zanzibar. In three consecutive years its first decided blow occurred on December 25th. January is generally considered the worst month in the year for anchoring on the northern side of Johanna, as strong northerly winds sometimes occur, but heavy winds seldom blow home to the island; frequently, the only indication of a very strong breeze outside is a surf on the beach, which prevents landing.

Harbour lights (*Occasional*) (*Lat. 12° 9' S., Long. 44° 24' E.*).—Five small lights are exhibited at Mutsamudu when the Messageries mail steamer is expected, viz., on the 24th and 30th of each month; also, when any vessel is expected or signalled as approaching the anchorage; they are as follows:—

1. At the Signal Station near the Citadel, at 226 feet above the sea, a *fixed white* light visible from a distance of 8 miles in clear weather.
 - 2 and 3.—Leading lights for the Fontaine anchorage, shown from beacons, both of which show well by day; Front light *red*, Rear light *green*. When in line they bear S. 34° E. The Front beacon is on the shore, 7 cables westward of the town; the Rear or Paget beacon, on a hill about 500 yards from the Front beacon.
- Both lights are elevated 10 feet above high water, and visible from a distance of 4 to 5 miles in clear weather.
- 4 and 5.—Leading lights for anchorage mark and for clearing shore reefs:—Front light, *green*, at the western extreme of the town; Rear light, *red*, near the Custom-house and about 150 yards from the front light; when in line they bear N. 74° E. The lights are visible from a distance of 4 to 5 miles in clear weather.

The point of intersection of the two pairs of leading lights marks the best anchorage, off the watering place.

Reef.—A reef about 1½ cables wide fronts the coast from Mirondsi point southward nearly to the line of the beacons; immediately abreast of, and a little south-westward of the town, the reef is broken, permitting access to the shore at all times of tide, but the landing is not good.

Beacons.—See harbour lights.

Anchorage.—The anchorage off Mutsamudu, known as the Town anchorage, and to a less extent that known as the Fontaine anchorage, is limited, and close to the shore reef; vessels should there-

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DIRECTIONS.

Plan of Mutsamudu and Patsi roads on 2066. Var. 7° 10' W.

fore be prepared to anchor immediately on getting bottom with the hand-lead. It has been stated by a resident that in a course of 7 years, during which the bay was visited at all seasons, the only accidents which had happened were to two vessels which were simply blown to sea by wind off the land. Nevertheless, this is not a desirable anchorage during the North-east monsoon.

During the South-west monsoon, the water is quite smooth and the anchorage safe. Vessels should lie with a good scope of cable to avoid the risk of dragging during the occasional squalls off the land.

The Fontaine anchorage, abreast of the cocoanut plantation, is the best. A good berth, as before stated, is in about 15 fathoms, sand and shells, at the point of intersection of the two lines of leading beacons, and it is attained by approaching with the Fontaine beacons in line bearing S. 34° E., and anchoring at the moment when, or rather before, the other two beacons are in line. The vessel's position will then be about 2 cables outside the 3-fathoms line.

The Town anchorage is not recommended, the bank here being very steep, with a depth of 12 fathoms at only half a cable from the 3-fathoms edge.

Directions.—No directions are necessary for a steam vessel other than those contained in the remarks on the anchorage. During the South-west monsoon, sailing vessels should approach Mutsamudu road from the westward, where a fresh breeze will often be found, whilst it is calm to the eastward; approaching from this direction, give Saddle island a berth of 2 miles, as at times there is considerable swell and no wind under its lee; from thence a vessel will often fetch the anchorage without a tack. Be prepared for squalls, which occasionally come off the land in furious gusts.

During the North-east monsoon, on the contrary, it should be approached from the eastward, on account of light winds and westerly currents, which sometimes sweep a sailing vessel away towards Mohilla.

Supplies, except bread, are plentiful and cheap at Mutsamudu the cattle are small, but good. Fowls, sweet potatoes, yams, cocoanuts, fruits, and other supplies are abundant. If large quantities are needed, 24 hours' notice should be given.

Water.—The watering place is abreast of Fontaine anchorage, and is a small stream near the front beacon; it flows through the cocoanut plantation, and generally discharges into the sea by two mouths. The water is excellent during the dry season, but during the rainy season the quantity of decaying vegetable matter brought down from the hills renders it impure. In watering, a considerable length of hose is required to enable the boat to lie afloat. There is another stream near

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Plan of Mutsamudu and Patsi roads on 2066. Var. 7° 10' W.

the town, but it is used by the natives both for bathing and washing clothes. Another stream, abreast of which a vessel might anchor, runs into the sea about $1\frac{3}{4}$ miles westward of the town.

Communications.—The steamer that runs between Diego Suarez and Zanzibar calls here on the 20th or 21st of each month outward bound, and on the 29th returning; a steamer of the Havre Peninsula Company calls once a year.

Johanna is in communication with Mayotta and the other islands by means of flashing signals; Mayotta with Majunga by wireless telegraphy.

Tides.—It is high water, full and change, at Mutsamudu, at 4h. 30m.; springs rise about 14 feet.

Plan of Johanna island on 563.

Saddle island (*Lat. 12° 10' S., Long. 44° 13' E.*), off the north-western point of Johanna, is small, bluff, and saddle-shaped, as its name implies, and is about 400 feet high. The island is apparently bold on its northern side, but a reef extends nearly one mile south-westward from it, and thence trends eastward, and, as a fringing reef, skirts the southern coast of Johanna. There is said to be good anchorage in about 12 fathoms, off the northern side of Saddle island.

Tide rips.—Off Saddle island, as off the other extremes of Johanna, tide rips give an appearance of shallow water beyond the reef to an extent of a mile or two. The bottom is probably rocky and uneven, but in passing over these appearances of broken water no bottom has ever been found with the hand-lead, and it is considered that no dangers exist beyond the reef, which is plainly visible except at high water.

S.W. coast.—This line of coast is about 23 miles in extent, and though some parts project, is slightly concave as a whole; several spurs of high land extend from the summit towards the coast. The western half of this coast is in most parts fringed by a reef nearly one mile wide in places. Eastward of Pomoni, in most parts, there is no fringing reef.

There is an isolated $2\frac{3}{4}$ -fathoms shoal about 5 cables off Voani; the coast at Voani is for a short distance free from reef, and there is said to be a dhow anchorage.

Plan of Pomoni harbour on 2066.

POMONI HARBOUR is an oval basin about 3 cables long by 2 cables wide, between coral reefs dry at low water, springs; it has from 7 to 12 fathoms, black sand, with deeper water in the entrance, which is less than a cable

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Plan of Pomoni harbour on 2066. Var. 7° 10' W.

wide. The reefs, within the harbour, are steep-to, but abreast of the shore the bank is shelving; in case of necessity a vessel can beach for repairs. This harbour will safely contain 5 or 6 small vessels if properly moored, but vessels of over 200 feet in length should not enter the harbour, there not being space enough for them to moor with sufficient scope of cable.

During the North-east monsoon, the harbour is quite smooth, and at low water it is as smooth as a dock at all times of the year, though strong gusts of wind come down occasionally off the land.

During the South-west monsoon, it is generally smooth enough for all purposes, but when strong southerly or south-westerly winds occur at spring tides, although all heavy sea is broken by the reefs, sufficient swell rolls in over them at high water to raise a confused boiling sea in the harbour, to cause a considerable outset through the channel, and to make dry landing impracticable. If it were to blow very hard from that quarter at high water springs, the harbour would be unsafe, unless special precautions were taken, such as placing an anchor close over to the weather side of the harbour, so as to lie with a long scope of cable; but the South-west monsoon rarely blows home with force, and there is no record of its ever having amounted to a gale.

Shoal (*Lat. 12° 15' S., Long. 44° 25' E.*).—A coral shoal, one cable in extent, with a least depth of 5 feet on its eastern extreme, lies in the centre of the entrance to the harbour, abreast of the southern point of the north-western reef, and less than half a cable from it; the shoal does not generally show well, and is treacherous for boats, blind rollers occurring at long intervals.

Beacons.—An iron pole, surmounted by an arrow, is placed at the inner end of the entrance channel, 30 feet within the northern extreme of the south-eastern reef. Two white iron cylinder beacons, which are elevated about 165 feet above sea level and are very conspicuous, are situated as follows: One N. 8° E. distant 8 cables, and the other S. 68° E. distant $7\frac{7}{10}$ cables from the entrance beacon.

Two loopholed walls, which are used as a leading mark for entering the harbour, are situated between the northern white beacon and the northern village.

Directions.—Pomoni harbour may be known from seaward by its being under a saddle in the high land, and by two peaks like dogs' ears, immediately over the harbour; also by the sugar factory, with its white square chimney, about E.S.E. distant 7 cables from the entrance.

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Plan of Pomoni harbour on 2066. Var. 7° 10' W.

The best entrance channel is that eastward of the central shoal; it is about 150 yards wide, and the reef forming the eastern side of the channel is steep-to and distinctly visible. The two loopholed walls northward of the northern village, which are nearly on the same level and easy to distinguish, in line bearing N. 16° E. lead through in mid-channel. When abreast of and about 50 yards from the beacon on the south-eastern reef, haul sharp round to the eastward into the harbour.

Vessels up to 180 feet in length can easily enter the harbour.

There is also a deep channel between the central shoal and the north-western reef, but it is very narrow, and should only be used on an emergency.

The harbour being very small, care is required not to enter with too much way, so as to be able to turn short round the extreme of the south-eastern reef. Vessels should moor N.W. and S.E., and keep an open hawse according to the prevailing monsoon.

Outer anchorage (*Lat. 12° 17' S., Long. 44° 24' E.*).—There is good anchorage in 14 fathoms, about 2½ cables off the mouth of the stream near the sugar factory, with the factory chimney bearing from N.E. to N.E. by E.; here there is a break in the fringing reef; there are said to be 30 fathoms at 5 cables from the shore. The anchorage should be approached on the given bearings of the factory, as on the north-western side of this line the reef extends 2 or 3 cables from the shore, and on the south-eastern side are some detached rocks, the largest of which only covers at high water.

Being immediately abreast of the stream, this anchorage is convenient for vessels watering during the North-east monsoon. In the South-west monsoon, vessels will generally find it practicable, but they should be prepared to leave on the appearance of a fresh breeze or on a heavy swell setting in.

Wind and Weather.—During the North-east monsoon, light land and sea breezes generally prevail, and occasionally shift from one to the other several times during the day; at this time, there is no difficulty in going out under sail if a proper opportunity be chosen, but it should not be attempted unless the land wind is steady. In 1883, the first blow of the North-east monsoon came on the 14th January, accompanied by heavy squalls, lightning, rain, and occasional thunder.

During the South-west monsoon, sailing vessels frequently have to wait some days for an opportunity to get out. In May, rollers are heavy at times along this coast, and the rain is incessant.

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Plan of Pomoni harbour on 2066. Var. 7° 10' W.

Tides.—It is high water, full and change, at Pomoni, at 4h. 30m.; springs rise 14 feet. French authorities give the time half an hour earlier but the rise the same.

Supplies.—Repairs, &c.—Cattle and other supplies are plentiful, the latter being brought round from Mutsamudu when required in any quantity. Fruit is cheap and plentiful. Small repairs to vessels with no competent artificers may be effected through the kindness of the sugar planters, who possess a forge; they also have a steam launch.

Water.—There is a good watering place at the stream near the factory; the water is excellent, and may be made to run into a boat by placing a starting hose a little way up the rocks above the bridge. Near high water, in fine weather, boats can cross the reef from the harbour and enter the stream, but when there is any swell they have to lie outside the surf with a great length of hose, and must return to the harbour by the ship channel; of course when there is much surf, landing at the stream is impracticable, but this is of rare occurrence.

There is also a stream in the harbour near the northern village, with a deep pool inside; this is convenient for washing clothes at, but it comes from marshy ground, and is probably not wholesome for drinking. Boats can reach it at all times.

Communication.—Sugar vessels trade between Mauritius and Pomoni at intervals of about 2 months; except by dhows there is no other mode of communication, but that would appear to be no great difficulty with French mail steamers calling at Mutsamudu monthly.

Plan of Johanna island on 563.

East coast.—The South point of Johanna is bluff, of considerable height, and surrounded by a reef extending about 3 cables; two islets or rocks stand on its south-eastern extreme. During the South-west monsoon, there is occasionally a heavy sea, with overfalls, off this point; at times it has been found rolling heavily as if the water were shallow, but no bottom has been found with the hand-lead.

From the South extreme of Johanna, the coast trends North for about 20 miles to the north-eastern point; it is high and rocky, with but few indentations, and is apparently steep-to; it is fringed by coral reefs in places to a short distance.

At Deumoni (*Lat. 12° 15' S., Long. 44° 33' E.*), 7 miles from the South point, there is a boat harbour, and northward of that point are three rocks above water near the shore. At Deumoni is a sugar

General charts 2762, 597, 748a, b.

Plan of Johanna island on 563. Var. 7° 20' W.

estate belonging to the Sultan, with a large factory built of stone, and all the machinery necessary for making sugar. There is said to be good anchorage off the factory in from 8 to 15 fathoms, at 3 or 4 cables from the shore, at all times of the year except August and September, when strong easterly winds prevail. As but little is known of the depths along this coast, it should be given a wide berth.

Off Bambao, $3\frac{1}{2}$ miles northward of Deumoni, there is anchorage; close northward of it, the fringing reef extends about 5 cables off-shore.

Chart 2741, Mayotta island.

MAYOTTA ISLAND.—Mayotta lies 37 miles south-eastward from the South point of Johanna. It is of very irregular form, 21 miles long North and South, with an average width of 6 or 7 miles; it is completely surrounded by a barrier reef, with many breaks and passages, varying in distance from 4 to 8 miles, and one outlying reef 12 miles from the island. Mayotta is remarkable from all points of view, owing to its uneven surface; volcanic peaks rise in all parts, the highest being Mavégani, about 4 miles southward of the centre of the island; Mavégani has two peaks close together, of which the westernmost is the higher, being 2,164 feet above the sea, the other being 2,105 feet.

The most remarkable mountain is Uchongui (*Lat. 12° 55' S., Long. 45° 3' E.*), a sugar-loaf peak, 2,105 feet high, which rises from comparatively low land at less than 3 miles from the southern extreme of the island. From the southward, Mount Uchongui will be seen before any other part.

The non-mountainous parts of the island consist of deep ravines through which torrents rush in the rainy season, but which are dry at other times. The soil is formed of volcanic débris and is extremely fertile, but though the surface is generally undulating, it almost everywhere becomes very low as the sea coast is neared, terminating in soft, muddy, mangrove swamps, over a large part of which the tide flows at high water.

Mayotta was first established as a French colony in 1844; there is now a small military and naval depôt at Zaudzi, adjoining and connected with Pamanzi island, where the Administrator-in-Chief of the island resides. There are also many villages, of which Sada is the most important. Zaudzi is the principal port, and secure anchorage is at all times to be had, either in Zaudzi road, or southward of Zaudzi island, or in Pamanzi bay. Besides which, there are many other good anchorages. From the

General charts 2762, 597, 748a, b.

Chart 2741, Mayotta island. Var. 7° 20' W.

westward or northward, Zaudzi road is approached by Zamburu or Duamuni passes, and from the eastward by the Bandéli pass.

Products.—The island in former times had a prosperous sugar-cane cultivation, as the ruins of many mills scattered about show. There is still a small quantity cultivated, but the principal product now is vanilla, but there is not much trade. The forests contain a few trees fit for building. The cattle reared are only sufficient for the needs of the inhabitants. Fruit and vegetables are abundant.

Population.—The population in 1910 was 10,000, of whom 120 were Europeans or assimilated, and 30 Asiatics. The native population consisted of Sakalavas, from Madagascar, Africans, a few Indians, but the greatest number were Arabs.

Climate.—Mayotta has the reputation of being very unhealthy; the large expanse of mangrove swamps being productive of malaria and fever. In this respect, as in many others, Mayotta differs from the other Comoro islands, which are generally considered healthy.

From January to April, the mean temperature at noon ranges from 84° to 90°; the greatest heat is in January and February, when at times it reaches 93°; the mean temperature of the year is 77°. The range of the barometer is between 29·7 and 30·0 inches. The rainy season is from November to April.

Winds, currents, communication.—*See* pages 189, 190.

Pilots.—Government pilots are stationed at Pamanzi island, and generally come off to vessels about to enter by the Bandéli pass if the signal is made. Another Pilot station is at the S.E. extreme of Mayotta island opposite the Saziley South pass. For the other passes no pilot can be procured, as they are out of signal distance of Pamanzi.

The charge for pilotage of merchant vessels is 25 centimes per registered ton, entering and leaving combined. Vessels have to pay pilotage if a pilot is not taken. French vessels of war and coasting vessels of Nosi Bé and the Comoro islands are exempt from pilotage dues.

Vessels should communicate with the authorities before seeking anchorage elsewhere than in Pamanzi bay.

Barrier and outlying reefs.—The chain of Barrier reefs which encircles the island on the northern, north-eastern, south-eastern, and southern sides is at a distance from the coast of between 4 and 5 miles; and on the western side upwards of 8 miles; besides which, to the north-westward, is a detached reef about one mile in

General charts 2762, 597, 748a, b.

Chart 2741, Mayotta island. Var. 7° 10' W.

diameter, with $2\frac{3}{4}$ fathoms water; its centre lies with the high northern part of Zamburu island bearing S.E. by E. distant $7\frac{3}{4}$ miles.

The Barrier reef has about 14 passes through it, most of which are deep enough for all classes of vessels. The Barrier reef, whilst enclosing spacious sheltered anchorages and secure ports in all directions, is most dangerous to vessels approaching the island without due caution, owing to its great distance from the land, and the uncertain currents which prevail in the vicinity.

The various parts of the reef are generally visible by the discoloration of the water, which, when the sea is calm, is in many places the only sign of danger, the outer edges being steep-to, with no bottom in many places at 50 fathoms close-to.

Zamburu, or Saddle island (*Lat. 12° 39' S., Long. 45° 3' E.*), is $2\frac{1}{2}$ miles from the north-western end of Mayotta; it is about one mile in diameter and 918 feet in height. The saddle appearance of the island is most conspicuous when viewed from north-eastward and south-westward.

Anchorages.—There is temporary anchorage on Prudente bank, 2 miles north-westward of Zamburu, in from 6 to 10 fathoms, sand and coral. Also on the edge of the flat extending north-eastward of Zamburu; the flat is steep-to, and must be approached with caution, anchoring directly a depth of 10 fathoms is obtained.

Between Zamburu and the main island are the two Choazil islands, 164 and 230 feet high.

NORTHERN AND EASTERN PASSES.—**Zamburu pass.**—The approach from the westward to Zaudzi, in Pamanzi bay, for vessels of moderate draught, is by the Zamburu pass. Its entrance, $1\frac{1}{2}$ miles wide between the reefs, lies between Zamburu island and North reef, about 17 miles from Zaudzi. Vessels above 20 feet draught should use the Duamuni pass, eastward of North reef, which has no bar; though the channel to Zaudzi, common to both, is scarcely to be recommended for vessels above moderate draught. Bandéli pass, the eastern approach, is probably under almost any circumstances the best, and has a depth of 23 feet at low water.

Bar.—Zamburu pass, about $1\frac{1}{2}$ miles wide, is obstructed by a bar, 4 or 5 cables across, connecting Zamburu island with North reef; the least known depth is 23 feet about $3\frac{1}{4}$ cables southward of the leading mark, on which the depth is 26 feet; possibly less water may exist. There are upwards of 20 fathoms immediately outside the bar, the water deepens again to over 20 fathoms directly it is crossed.

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Chart 2741, Mayotta island. Var. 7° 10' W.

Abreast of Cape Duamuni, the Zamburu and Duamuni passes join; from thence for about 3 miles south-eastward of the cape the channel between the shoals is but 3 cables wide, but the water is deep.

Buoyage.—Where buoyage is used in the passes of Mayotta, the French uniform system is in force, thus:—Starboard hand buoys entering from seaward are conical with conical topmarks, and painted red; port hand buoys are conical with cylindrical topmarks, and painted black.

Red buoys are supposed to mark the N.E. extreme of Chaloupe reef; the South side of the channel abreast of the $2\frac{1}{4}$ -fathoms patch north-westward of Belette reef; a 2-fathoms patch abreast of Belette reef; Coq, and Prevoyante reefs. Black buoys should mark the south-western side of Great North-east reef, abreast of Chaloupe buoy; also a $2\frac{1}{4}$ -fathoms patch between it and Belette; Belette reef of $1\frac{1}{2}$ fathoms; Laclocheterie reef; and the S.W. extreme of the south-eastern of the three reefs eastward of Point Congo.

Caution.—No dependence must, however, be placed on buoys maintaining their positions when so much exposed and so far distant from any controlling supervision. The shoals themselves are distinctly visible towards low water, which is the best time for entering or leaving.

Peiho reef (*Lat. 12° 41' S., Long. 45° 13' E.*), on which the ss. *Peiho* touched in 1894, lies on the north-eastern side of the channel south-eastward of Prevoyante reef, with Longoni point bearing about S.W. $\frac{3}{4}$ W. distant $1\frac{9}{10}$ miles.

Directions.—Approaching Mayotta from the north-westward Zamburu island is easily recognised; it should be approached on a bearing that will clear the outlying dangers. When from 3 to 4 miles distant from it, steer to bring the second summit of Pamanzi island, a conical peak, on with the extreme of Cape Duamuni bearing S. 42° E., and run in on that mark, which leads over the bar in about 26 feet at low water.

When Zamburu peak bears W. by S. steer about E. by S. until the second summit of Pamanzi is a little open of Congo point, when, assuming the buoys to be in position, run in between Chaloupe buoy and the buoy abreast of it; from abreast of Chaloupe buoy edge southward to bring the same summit of Pamanzi in line with Congo point bearing S. 37° E. (*see view C on chart*). Observe, however, that Congo point is not quite the extreme of land, as shown in view C on the chart; there is Mokaun point beyond it, ill defined on the chart, which a stranger is apt to mistake for Congo point.

General charts 2762, 597, 748a, b.

Chart 2741, Mayotta island. Var. 7° 10' W.

The leading marks in line, a little varied to give the buoys a berth, lead through the channel between the buoys nearly up to Congo point. When Zamburu island peak comes in line astern with Morne hill, bearing N. 57° W. (*see* view D), keep them so, steering S. 57° E., which leads between the fringing reef extending from the coast from Congo point eastward, and the shoals marked by a buoy on the opposite side of the channel, but very close to the fringing reef, and probably it would be better to keep Zamburu peak a little open to the northward.

When eastward of Congo point, keep Zamburu peak a little open northward of Morne hill, to give a wider berth to the fringing reefs. Aombé island, which is steep-to on its western and southern sides, may be left about 2 cables on the port hand; from thence pursue a mid-channel course into Pamanzi bay, or through Zaudzi road round to the anchorage south-westward of Zaudzi. In proceeding to the last-mentioned anchorage, when rounding Zaudzi spit, marked by a buoy, observe that the four Nossi Effatsi islets well open westward of Mouniameri island leads westward of the spit.

Duamuni or North-east pass is the channel about one mile wide between North reef and Great North-east reef, and appears free from danger, with the exception of the $4\frac{3}{4}$ -fathoms shoal close eastward of the leading mark, distant about $1\frac{8}{10}$ miles from the summit of Cape Duamuni.

To enter, bring Cape Duamuni on with Muruamu-Be mountain, S. 30° W. (*see* view B on chart), which will lead in between the reefs, and when Zamburu peak bears W. by S., haul to the westward of the leading mark to give a wide berth to the $4\frac{3}{4}$ -fathoms patch mentioned, until the peak bears West or W. $\frac{1}{4}$ S.; then keep away south-eastward between Chaloupe buoy and the buoy abreast of it, and proceed as for the Zamburu pass.

Choazil islands pass (*Lat. 12° 40' S., Long. 45° 2' E.*) lies southward of Zamburu island; it is 5 or 6 cables wide between the reefs, with depths of $5\frac{1}{2}$ fathoms; the leading mark is the northern Choazil island on with Morne hill bearing East; from thence, northward of North Choazil island and Cape Duamuni to the leading mark for the Zamburu channel.

Longoni bay.—Anchorage.—For vessels using either of these passes, there is good anchorage in Longoni bay on the northern coast of Mayotta, about 7 miles before arriving at Zaudzi or Pamanzi bay, in from 10 to 20 fathoms. Under cover of Longoni point, the eastern extreme of the bay, is Longoni cove (*see* plan on chart), about 2 cables long by one cable wide, with from 4 to 9 fathoms, mud. Good firewood and water may be obtained here, and fish are plentiful.

General charts 2762, 597, 748a, b.

.. Chart 2741, *Mayotta island*. Var. $7^{\circ} 20'$ W.

Longogori pass, on the eastern side of Mayotta, is a narrow cut in the reef, about $3\frac{1}{2}$ miles southward of Pamanzi island; it has plenty of water, but is very tortuous and only suitable for boats.

BANDÉLI PASS (*Lat. $12^{\circ} 53'$ S., Long. $45^{\circ} 17'$ E.*), also on the eastern side of Mayotta, and its entrance about $1\frac{1}{2}$ miles south-westward of the Longonori pass, is about 5 miles southward of Pamanzi island, and is the usual channel for vessels approaching Zaudzi from the eastward. Bandéli island, within the reefs and 5 cables southward of the leading line through the pass, has a quarry or cutting on its eastern side which renders it conspicuous from seaward.

Depths.—There is a depth of 23 feet at low water in this pass.

Beacons.—Buoys.—A whitewashed obelisk stands on a spur of Mount Mavégani, and a white conical beacon on the cliffs immediately behind White rock; when in line they bear N. 74° W. and serve as leading mark for the pass when over the bar. They lead over the bar in a depth of 17 feet.

The following leading beacons have also been established for passing the bar:—

A white front beacon constructed of planks on north-eastern extremity of Amoro point, at a distance of $9\frac{1}{2}$ cables, N. 25° E., from White rock beacon; a wooden pyramidal rear beacon, 49 feet in height, surmounted by a flag, and having the side facing the passage covered with battens, at a distance of $18\frac{8}{10}$ cables, N. 50° W., from the front beacon.

These beacons in line, bearing N. 50° W., lead through the outer part of Bandéli passage over the shallow ridge which extends across it in a depth of 23 feet. They are difficult to distinguish in the afternoon.

There is also a red pole beacon with cross topmark near southern edge of Ajangua reef, at a distance of 2 miles and $6\frac{6}{10}$ cables, S. 78° E., from White rock beacon; a red pole beacon with diamond-shape topmark on south-western edge of Ajangua reef, at a distance of $19\frac{1}{2}$ cables, S. 80° E., from White rock beacon; and a black pole beacon with rectangular topmark, surmounted by a globe, on northern edge of Bandéli reef, at a distance of 2 miles, S. 68° E., from White rock beacon.

A red conical buoy marks the 17-foot on the bar, two red conical buoys mark the southern extremes of the inside portion of Ajangua reef, and a black buoy marks the northern extreme of Bandéli reef.

General charts 2762, 597, 748a, b.

Chart 2741, and plan on. Var. 7° 20' W.

No dependence must be placed on the buoys maintaining their charted positions.

Directions.—To enter Bandéli pass, steer in with the beacons on Point Amoro in line N. 50° W. (a remarkable notch on the most distant ridge is on this line), which leads 160 yards southward of the 17-foot. As soon as the bar is cleared starboard the helm and get on to the leading mark, White rock beacon and Mavégani obelisk, which will lead through in mid-channel. Entering in the morning with the sun astern, the reefs show well, but, as before stated, the beacons are difficult to distinguish in the afternoon. The tidal streams are very strong at springs, and the turn of them is very quick. The flood sets to the S.W. outside the bar; the ebb sets to the S.E. inside the bar.

When Uchongui peak is open north-westward of Bandéli island, a vessel is within the reefs, and may haul northward for the West extreme of the Ajangua islands; pass these islands about 2 cables distant and then steer eastward of Buzi island, giving the rock off it a berth of at least a cable. If preferred, a vessel may pass westward of Buzi, but should give its south-western end a berth of $2\frac{1}{2}$ cables to clear a small reef off it, and pass within $1\frac{1}{2}$ cables of its northern side to avoid the coral patches extending southward from Choa point and the coast westward of it to within 3 cables of Buzi island.

Buzi island is 541 feet high, and wooded near the summit. The rock off its north-eastern side is covered at high water.

From Buzi island, if bound to the anchorage southward of Zaudzi, steer direct for it, avoiding Orestes rock, which lies in the anchorage and is marked on its western side by a white spindie buoy.

If bound to Zaudzi road, the anchorage northward of Zaudzi, or to Pamanzi bay, observe that the easternmost of the four Nossi Effatsi islets touching the western side of Mouniaméri island leads eastward of Choa point shoals, and that the same islet kept well open of Mouniaméri, leads westward of Zaudzi spit.

Plan of Pamanzi on 2741.

Pamanzi island (Lat. 12° 46' S., Long. 45° 18' E.) is about $1\frac{1}{2}$ miles from the eastern side of Mayotta, on the eastern part of the Great North-east reef; it is about $3\frac{1}{2}$ miles long, North and South, and $2\frac{1}{4}$ miles wide. Its eastern summit, on which there is a Signal station, is 782 feet high, with a flat top; the conical hill three-quarters of a mile westward of the Signal station, called the Second summit, is that which forms a leading mark for the Zamburu pass. Near the north-eastern extreme of Pamanzi is Zeánn lake, apparently the crater of an extinct volcano.

General charts 2762, 597, 748a, b.

—ZAUDZI ISLAND.

Plan of Pamanzi on 2741. Var. 7° 20' W.

Zaudzi road, on the western side of Pamanzi island, northward of Zaudzi island, and sheltered on the northern side by Mouniaméri, Cacazou, and Vatou islands, with their reefs, is a secure anchorage upwards of a mile in extent East and West by about $3\frac{1}{2}$ cables in width, with depths varying from 8 to 14 fathoms; it is especially secure during the South-west monsoon. Pamanzi bay is the small bight between Zaudzi and Pamanzi; in it are several rocks; the outer one is marked by a white cylindrical buoy.

Military establishment.—Zaudzi island lies westward of Pamanzi, and is connected with Mamutzu peninsula by a neck of sand, on which a causeway has been constructed. The French official establishment is on Zaudzi island, and consists of an Administrator-in-Chief of the islands, whose residence is near the summit of the Mamutzu peninsula, and various colonial officers, some artificers and seamen, and about 50 Europeans and a few native soldiers. There are many substantial Government buildings and storehouses, numerous huts, and jetties available for boats at half tide both on the north-eastern and south-western sides, as well as one at Mamutzu.

Zaudzi spit.—Buoy.—Zaudzi spit extends nearly 4 cables westward from the north-western end of Zaudzi; its western extreme is marked by a white buoy in about 8 fathoms. As before stated, the four Nossi Effatsi islands well open westward of Mouniaméri island leads westward of it.

Orestes rock.—Buoy (*Lat. 12° 47' S., Long. 45° 16' E.*).—This rock lies about $1\frac{1}{4}$ cables southward of Zaudzi spit, and $1\frac{1}{2}$ cables from Zaudzi West jetty-head. The rock is a cone of coral not more than 12 yards in diameter at its base, rising to two sharp pinnacles, which are so small that the lead can hardly be placed on them; one of these pinnacles has only 3 feet over it at low water springs, with from 4 to 5 fathoms all round at 25 yards distance. A white spindle buoy marks the western side of this rock.

Anchorage.—There is good anchorage during the North-east monsoon anywhere southward of Zaudzi spit, avoiding Orestes rock. A good berth is in 11 fathoms, mud, with the West extreme of Zaudzi N. by E. $\frac{1}{2}$ E., and the South extreme of Pamanzi S.E. $\frac{1}{2}$ S.

The best anchorage during the South-west monsoon is in Zaudzi road, or closer in towards Pamanzi bay, where at that season it is always smooth. The outer danger is a 19-feet coral shoal, about one cable north-eastward of Zaudzi jetty, marked on its north-western side by a white cylindrical buoy. The bottom is foul southward of the buoy. A good berth will be found in 7 fathoms, at the spot indicated on the plan.

General charts 2762, 597, 748a, b.

Plan of Pamanzi on 2741. Var. 7° 20' W.

Tides.—It is high water, full and change, at Zaudzi, at 4h. 10m.; springs rise about 12 feet; the flood runs southward and the ebb northward.

Supplies.—Poultry, vegetables, and fruits may be obtained at Zaudzi, and cattle are brought from the main island. For other products, *see* page 209.

The water obtained from the reservoir at Zaudzi is of indifferent quality. The Government establishment is supplied direct from the main island, where there is an abundance of good water; it is brought over in boats, and stored in a large reservoir on Mamutzu peninsula.

Light draught vessels can beach for repairs abreast of the eastern end of the causeway in Pamanzi bay, buoying the rocks previous to beaching.

Communication.—*See* page 190.

Chart 2741, Mayotta island.

SOUTHERN and WESTERN PASSES.—The southern and western passes are but little used, as they lead to unfrequented parts of the island and are unbuoyed; a short account of them is, however, here given.

Saziley passes, on the south-eastern side of the island, are three in number, viz., the North, Middle, and South Saziley passes; they are divided from each other by two coral flats, the southern of the two flats being crowned by Sandy islet. These passes, though but little used, have deep water.

North Saziley, though 3 cables wide, is the narrowest of the three passes. The leading mark between the reefs is, the sugar-loaf part of Mount Uchongui just open northward of Morne Carré, about N. 80° W. This mark takes a vessel rather close to the coral reef on the southern side of the pass. *See* view F on chart.

Middle Saziley (*Lat. 12° 58' S., Long. 45° 14' E.*) is about 6 cables wide, and the leading line is the sugar-loaf part of Mount Uchongui just open southward of Morne Carré, N. 69° W. (*see* view G on chart). This pass has about 7 fathoms water.

South Saziley pass is about one mile wide. To enter, bring a clump of trees on the top of a low hill near the southern point of the island over Dapani point, bearing N. 73° W. Buni island bearing W. $\frac{1}{2}$ N. also leads in. *See* view H on chart.

Barrier reef.—The end of the barrier reef forming the southern side of Saziley South pass bears S.E. $\frac{1}{4}$ S. $2\frac{3}{4}$ miles from Saziley point; from thence, it curves round the southern end of Mayotta, gradually

General charts 2762, 597, 748a, b.

Chart 2741, Mayotta island. Var. 7° 20' W.

increasing its distance from it, and without the slightest break in the reef for a distance of 18 miles, when the narrow break known as Boat pass occurs. Here the reef is $5\frac{1}{2}$ miles from the nearest land, Point Cani.

The whole space enclosed by this stretch of reef, with the exception of a few coral patches, for which *see* chart, would appear to be good navigable water with anchorage space for a navy.

Boat pass, probably so called only from its being narrow, has very deep water. The leading mark is Mount Uchongui, midway between Cani point and Cani hill, bearing N. 89° E. (*see* view K on chart). This pass should not be attempted without a pilot.

Boéni pass (*Lat. $12^{\circ} 55'$ S., Long. $45^{\circ} 0'$ E.*), about 3 miles northward of Boat pass and 14 miles southward of Choazil pass, is 6 miles from the nearest land, and the leading mark for it is the hill on Boéni point on with the eastern peak of Mount Mavégani bearing N. 85° E. (*see* view I on chart). This pass is upwards of 5 cables wide and very deep, but its distance from the coast renders Boéni point difficult of recognition.

Morne Rouge pass, about 3 miles northward of Boéni pass and 8 miles from the land, is safe and deep, but so far from the land that the leading mark cannot always be seen, which is, the northern side of Morne Rouge (or Red mount) on with the southern declivity of Montsapéré. Having entered by this pass and desiring to proceed to the anchorage at the head of Boéni bay, a vessel should run in on the leading mark given until the eastern point of Boéni peninsula is in line with Mount Uchongui S. 24° E., which then becomes the leading line until within about $1\frac{1}{2}$ miles of East point, when a direct course may be steered for Caroni island at the head of the bay, and it will lead up between the numerous reefs on either side to the anchorage.

About 3 miles northward of the Morne Rouge pass is a wide opening between the reefs, formerly known as the Great Western pass; so many shoal patches have been discovered in its entrance that it is best avoided altogether.

General charts 2762, 597, 748a, b.

CHAPTER VI.

MADAGASCAR.—GENERAL INFORMATION.—NORTH-EAST COAST.—
CAPE AMBER TO ANTONGIL BAY.

(Lat. $11^{\circ} 50'$ S. to Lat. $16^{\circ} 10'$ S.)
(Long. $49^{\circ} 10'$ E. to Long. $50^{\circ} 30'$ E.)

VARIATION IN 1911.—Decreasing 6' to 7' annually.

Chart 597, Delagoa bay to Cape Guardafui.

MADAGASCAR.—The description of the coasts of this large and important island, of which some particulars have already been given at page 2, is now preceded by a short outline and general idea of its physical and historical aspect, with other varied information; after which begins the detailed account of its coasts and harbours, commencing at Cape Amber in the North, and proceeding, in this chapter, down the N.E. coast as far as Antongil bay; and, in the following chapter, from thence regularly down the East and South coasts to Cape St. Mary, the southern extreme of the island.

In Chapter VIII., the description recommences at Cape Amber in the North, and in that and the two following chapters are completed in detail the descriptions of the N.W. and West coasts, again terminating in the South at Cape St. Mary.

Madagascar is naturally divided into a high interior region rising from 3,000 to 5,000 feet and more above the level of the sea, and a comparatively low and level country surrounding it, not much more than 400 or 500 feet in height. The principal peak, Mount Ankarat, the highest in the island, attains a height of 8,790 feet. From this peak, the range extends from 60 to 80 miles northward, 30 or 40 miles southward, upwards of 180 miles westward, and but a short distance eastward. It is intersected, on the western side especially, by rivers remarkable both for volume and length of course.

An East and West section of the island near Antananarivo, the capital, shows that a height of 4,000 or 5,000 feet is attained from the westward by a series of steps; but from the eastward, more suddenly, one slope effecting an ascent of 3,000 feet. The valley of Mándritsára, westward of Antongil bay, is remarkable; it is 30 miles long and 2,000 feet below the level of the mountains on either side. South-westward of Mount Amber, near the northern end of the island, is a precipitous rocky eminence, 1,000 feet high, covering

Chart 597, Delagoa bay to Cape Guardafui.

8 square miles; it forms a natural fortress, too steep to be climbed without artificial means, and entered by a narrow subterranean passage. The inhabitants of this district are called Antankarana, or "people of the rocks."

There are signs of recent volcanic action in different parts of the island, such as hot springs, extinct craters, and igneous rock, especially about the northern end. Earthquake shocks are also felt nearly every year. A long chain of lagoons exists on the eastern side of the island, running several hundred miles parallel with the coastline, leaving an irregular strip of land between them and the sea, and in one part affording, as is reported, an unbroken waterway, 50 miles long, with 5 to 5½ feet water. This irregular strip is covered with the richest green sward, and dotted over with masses of shrubs and clumps of trees. A large portion of the interior of Madagascar is still but little known.

History and Customs.—Madagascar was known to the Arabs at a very early period, and mentioned by their writers in the twelfth and thirteenth centuries. It was first made known to modern Europe by Marco Polo, in the latter part of the thirteenth century, under the name of *Magaster*. From 1506 to 1531 various parts were visited by Lorenzo Almeida, Fernando Soares, João Gomez d'Abreu, and others. The Portuguese gave it the name of San Lorenzo, and the English for many years called it St. Lawrence.

The Portuguese made no lengthened occupation of any part; early in the sixteenth century they built a fort at the south-eastern end of the island, but its occupants were massacred. In 1595, the Dutch had a settlement which they abandoned three years later on account of the climate. At the time of Henry IV. (1589-1610) the French named it *Ile Dauphiné*.

In 1642, a French East India Company was formed; they took possession of the islands Bourbon, now Réunion, and of Diego de Rois, or Rais, now Rodriguez; they also made settlements on St. Mary island, at Antongil bay, and at St. Lucia. On account of fever, the latter was abandoned a year later in favour of Fort Dauphin. Between that period and 1671, when Fort Dauphin was given up, French missionaries composed an imperfect vocabulary, grammar, and catechism in the Malagasy language.

In 1645 William Courteen, an English shipowner, formed a colony at St. Augustine bay, the chief being John Smart, but it was abandoned in 1646.

About 1724, pirates who had infested the Indian Ocean, being closely pressed by the vessels of war of all European powers, formed a settlement on St. Mary island until driven away.

Chart 597, Delagoa bay to Cape Guardafui.

Early accounts of Madagascar are full of glowing and extravagant praises of its fertility and natural wealth, and the natives described as very docile; but Robert Drury, who was a captive in the south-western end of the island from 1702 to 1717, found that inter-tribal warfare for the capture of cattle and slaves was very common. Later than the middle of the eighteenth century, there were about fifty distinct and independent tribes, each tribe having its own customs and laws.

In 1774, the French, under Count Benyowski, established the colony of Louisbourg at the inner part of Antongil bay, which lingered for two years only. Many years prior to 1792, the French had a post, as a commercial agency, at Foule point, but it failed, and in 1807, another French settlement being made at the same place, all died of fever. In 1815, a party of Englishmen from Mauritius established themselves at Port Looké by consent of the chiefs, but in consequence of the superintendent striking a chief the whole party were killed by his order, and he (the chief) was executed by other chiefs. Another party from Mauritius was well received and granted a large tract of land. Tamatave was captured by the English from the French in 1811; the garrison, however, died of fever, and the place was abandoned.

The western coast was divided into two distinct and absolute hereditary Sakalava monarchies, which were the most powerful governments on the island during a period of about 170 years. The Hovas were tributary to the Sakalava chieftains until the commencement of the nineteenth century, when they began to throw off the yoke by invading the Sakalava territory under Andrianimpôina and subsequently under his son, Radama I., who came to the throne at the age of 18 in the year 1810. Eventually, Radama married the daughter of the Sakalava king of Ménabé, and induced him to acknowledge the Hova supremacy. The western kingdoms submitting, their smaller neighbours were conquered in detail, so that in 1824 the greater part of the western side of the island was reduced to Radama's rule, and he assumed the sovereignty of the whole island. His successors made the same claim, but though the Hova authority became established in the central and eastern provinces, large portions of the South and West remained practically independent, and in other distant parts Hova rule was very slight.

Though imbued with the cruel superstitions of his countrymen, Radama I. possessed great natural intelligence; he received a British envoy in 1816 with great kindness, and made a treaty binding himself to abolish the export of slaves, he, in return, receiving an annual present of arms and ammunition. He wrote Malagasy in Arabic, and

Chart 597, Delagoa bay to Cape Guardafui.

French in Roman letters, and sent his two brothers to Mauritius to be educated; also, in 1818, received missionary teachers for his people, and military instructors for his army.

Radama I. died on July 27th, 1828, aged 36, and was buried in a silver coffin, vast quantities of wearing apparel and valuable articles being buried with him. He left one child a daughter, named Kaketaka, aged 14 years, but was succeeded in the government by his senior wife, Queen Ránaválona. She was cruel in the extreme, and endeavoured to undo all the good Radama had accomplished; she drove away the British Resident, broke the treaty against slave export, and caused a reaction in favour of superstition and barbarity. In 1835, all natives were prohibited from professing Christianity or attending the schools, and those who would not recant were put to death. During 25 years the country was isolated from all foreign influence and trade, and so much cruelty was used towards the Sákalávas of the North that they placed themselves under French protection, and in 1840 ceded Nosi Bé, which thenceforward remained a French possession. In 1861, Ránaválona died, and was succeeded by her son, Radama II., who only reigned 18 months.

Queen Ráosohérina followed, in 1863, and reigned 5 years; allowing the country in that period to make steady progress in morals, humanity, and religion. After her death on April 1st, 1868, Queen Ránaválona II., cousin of the former Queen, was crowned, holding the Bible in her right hand, while all idols were excluded from the ceremony. In February of the following year, the Queen and Prime Minister were baptised, and in September all idols and charms were buried by Royal command throughout the central province of Imérina. In 1870, the number of missionaries was increased from 10 to nearly 40. Domestic slavery had been an institution of the country from time immemorial, but on June 20th, 1877, the importation of African slaves was prohibited, and those in the country were emancipated as far as Hova authority extended. Queen Ránaválona II. reigned more than 15 years, generally loved for her kindness of heart and humane disposition, and was succeeded July 13th, 1883, by Queen Ránaválona III., destined to be the last ruler of an independent Madagascar.

The differences between the Hova government and the French became, during her reign, gradually more acute, until, in support of their claims, the French Government delivered an ultimatum by the hands of an envoy on the 18th October, 1894. On its refusal, an expeditionary force of 15,000 men landed at Majunga, on the N.W. coast, marched on Antananarivo, and occupied it on 30th September, 1895; the next day a treaty was signed by the Queen admitting all the French claims. A Protectorate was at once established, but, in 1896,

Chart 597, Delagoa bay to Cape Guardafui.

the island was declared a French colony, and on February 27th, 1897, the Queen was called on to resign, and was removed to the island of Réunion, where she arrived on the 4th March.

Madagascar remains a French colony. Diego Suarez bay, at the north-eastern end of the island, has become a naval station; and British Consuls are stationed at the capital and at Tamatave, and a Vice-Consul at Majunga.

Inhabitants.—As French authority and ideas gradually permeate the island, the characteristics of the Malagasy may be expected to alter considerably; they are as a rule excessively superstitious, both men and women wearing a great number of petty objects as charms. The tribes differ in their manner of treating the dead, but all greatly venerate the burying places, especially those of antiquity; therefore, strangers should be careful not to approach them for fear of giving offence inadvertently. Christian missions have been active in the island for many years, and it is computed that about 500,000 natives have become converts to Christianity, of whom about 50,000 belong to the Roman Catholic church, and about 450,000 to various Protestant churches.

Under the old régime, chiefs and high officials always expected to receive presents, not as bribes but as a consequence of the majority having no fixed salary. The whole population were formerly obliged to work for the Sovereign, *gratis*, whenever required to do so. This was altered by the French to 30 days' government work in each year, *gratis*. Domestic slavery had been abolished in 1896, and in January, 1901, the whole system of forced labour was finally abolished.

The Malagasy are supposed, from affinity of language and customs, to belong to the same race as that which now occupies the Malay peninsula and Polynesian archipelago, with a very slight admixture of Arabs and Europeans. The native population, according to the census 1906, 1909, and 1910, amounted to 2,901,952. Prior to 1885, the following estimate had been made of the principal tribes: Hovas, 750,000; Sakalavas, including the Bezanozeno and Antsianaka, 1,200,000; Bétsiléó, 1,500,000; Betanimena and Betsimisaraka, 1,000,000; total, 4,450,000. It had probably been much greater in former times, but the slave trade, wars, infanticide (for infants were put to death if born on unlucky days), trial by poison, and disease, decreased the population, as shown by ruins of deserted villages and rice grounds; while the fertility of the island would enable it to support five or even ten times its present population.

The Hovas were the most advanced in civilisation and intelligence, and, until the French conquest, also in political position; inhabiting Imerina, the central province, they ruled the greater part of the

Chart 597, Delagoa bay to Cape Guardafui.

interior, all the eastern portion and parts of the North-west. Their native district is about 80 miles in extent North and South, by 60 miles East and West, averaging about 4,000 feet above the sea. They have well-shaped heads, high foreheads, often a European cast of countenance, and jet black hair; they are rather below the average height of Englishmen and not so tall as the people of some other tribes, but have well-proportioned limbs and graceful movements; they are also more accustomed to hard work and more robust than other tribes.

The Bétsiléo inhabit the province South of Imerina, and stand next to the Hovas in industry, skill in agriculture, and manufactures. They are brave, warlike, and taller than the Hovas, the average height of the men being not less than six feet and of the women a few inches less; they are darker and worse-looking than the Hovas, and more nearly approach the negro. They evince both family affection and hospitality to strangers, but are quarrelsome and litigious. Untruthfulness, drunkenness, and cheating are common among them, as with other Malagasy tribes.

The Sákaláva tribes occupy the western coast; they are tall, have a manly air and gait, full countenance, and penetrating look; though something of the African appearance, they are better looking, often having Roman noses. There are several tribes, and 200 years back each had a separate government; they are now grouped in two great sections, the Sákaláva of Ménabé (or the South) and the Sákaláva of Ibóina (the North).

The Bára occupy about 20,000 square miles in the southern central district. They were very little known until a Hova army passed through their country in 1873; and being divided into petty tribes they were constantly at war with each other. They are superstitious, distrustful, churlish, and unfriendly to strangers.

The Tanala live in a narrow space about 200 miles long, in the dense forest between the Bétsiléo, the Bára, and the coast tribes. The northern part was under the Hovas and governed by a chieftainess; in the southern part they were independent and governed by a king. These people are by nature warlike and superstitious, but very hospitable.

The Tankái inhabit the open unhealthy strip between the two lines of forest on the eastern side. They are strong, robust, and hardy; they act as carriers of goods from the coast to the interior. They are very hospitable, a character common to all the people on the eastern side of the island.

The Sihánaka, or lake people, occupy the space between the forests and to the northward of the Tánkai, by the side of the great Lake

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Alaotra; their country is marshy, fertile, and unhealthy. The Sihánaka are remarkable for their love of ornaments, intemperance, and laziness; they were conquered by the Hovas in the early part of the last century. Immense herds of cattle find rich pasture in their country, and many of them belong to wealthy people in Antananarivo.

On the eastern coast are numerous small tribes. The Sákalávas are North of Antongil bay. The Bétsimisáraka occupy from Antongil bay to about 21° S., except the part opposite St. Mary island; they are the lightest in colour, with straight hair, and have most affinity to the Hovas. St. Mary island is occupied by people calling themselves *Zafi Ibrahim*, or sons of Abraham, as is also the coast opposite, though it is said the title is not claimed by the people of Ivongo. The Taimóro are between 21° and 22° S.; they are much darker than the Hovas and have frizzy hair. The Taifási and Taisáka are between 22° and 24° S., the former of a lighter complexion than usual, the latter are dark; both these tribes are reputed to have a higher code of morality than the Malagasay generally. The Tanosi are found southward of the 24th parallel, and the Tandrói occupy the southern end of the island about Cape St. Mary. Of the four last-named tribes very little is known. At Majunga, Márovoái, Morondava, and other places of trade, Arabs and Banyan traders from Kutch and Bombay have established themselves for many years, and have built stone houses and mosques.

There are traces of aboriginal tribes of a very low type previous to the Malayan incursion; some remains of them may still be found in the south-eastern and western sides of the island.

Antananarivo (Tananarive), the capital of the island, is in the province of the same name, and stands on a hill which rises 500 feet above an elevated plain amidst a massive range of mountains; the highest part of the hill is about 4,600 feet above the sea. In 1910, the population of the town was 71,769, of whom 2,000 were Europeans. During the last 20 or 30 years, the town has been greatly improved by the construction of houses on European models, and many large churches have been built since the re-admission of Europeans in 1862. Banks, newspapers, and the usual requirements of civilised communities are rapidly being supplied, and the greatest obstacle to progress, the want of roads, removed. In 1911 the city was provided with a water supply and furnished with electric light; it is also now in telephonic communication with Tamatave.

The houses of the native population generally, at the capital as in other places, were formerly nothing but frail though lofty bamboo huts, the wall being about 14 feet high, and the pitch of the roof

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23 feet. The fireplace, in the centre of such tenements, was composed of 4 or 5 stones, without even a hole in the roof to act as a chimney. A coarse strong matting over a part of the floor constituted seat, bed, and table. A law which prohibited poor people from building substantial houses was, however, repealed prior to the French occupation.

About the year 1820, the first printing press was established by the Church Missionary Society, and the Malagasy language was for the first time reduced to writing or print, consequently Roman characters were used.

During the middle ages, the Arabs introduced some words connected with chronology, astronomy, and superstition, and taught the Malagasy to reckon up to one million. The names of the twelve months are of Arabic origin, but the Malagasy year consisted of only 354 days, so that the year receded a complete cycle in 33 years.

Population.—The population of Madagascar, according to the census 1906, 1909, 1910, amounted to 2,921,476, of whom 14,218 were Europeans or assimilated; 5,306 Asiatics or Africans, and the remainder natives.

Madagascar is now divided for administrative purposes into 20 civil provinces and 3 military districts.

Lakes and rivers.—The largest lake on the island is the Alaotra, towards the eastern side, and about 85 miles north-eastward of the capital; it is about 25 miles long by 4 or 5 miles wide. The next in size is the Itási, in the province of that name, which is about 8 miles long.

There are many considerable streams on each side of the island, which become torrents during the rainy season, especially on the eastern side, where the rainfall is greatest, and finds its way to the sea by a succession of mountain gorges, cataracts, and rapids; such are the courses of the Mangoro, Mánanjára, Mátitánana, and many others. One fall of the Mátitánana is about 500 or 600 feet perpendicularly, and a fall of the Mania or Tsiribihina, on the western side, must be very great, as it can be heard at a distance of 40 miles. The largest river in Madagascar is probably the Bétsibóka, with its affluent, the Ikopa; see page 403. The Tsiribihina river (see page 428) and the Mangoka (see page 439) are almost as large as the Bétsibóka. The rivers on the eastern side of the island are mostly barred by extensive sandbanks thrown up by the south-easterly wind, which, in diverting the streams from their direct courses, form the extensive lagoons already mentioned as lying along a great part of that coast.

Ports and harbours.—There are several safe anchorages on the western side of the island and some excellent harbours on the

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north-western side, of which the most important are Hellville and Majunga. Diego Suarez bay, at the north-eastern end, contains several fine harbours within itself, capable of receiving the largest vessels. The other ports on the eastern side are Vohemar, Port St. Mary, Tamatave, Andovoranto, Vatomandri, St. Lucia bay, and others of less importance; the best anchorage southward of Diego Suarez is St. Lucia bay, and the most important one Tamatave, but all the anchorages on the east coast, except Diego Suarez, are very exposed.

The regulations for entering the harbours of French possessions in time of war will be found in Appendix V.

Minerals.—Coal, described as *lignite*, has been found at Nosi Bé, Ambavatobi, and at other points near the coast; it is fibrous and shining, burns readily with a long white flame leaving but little ash, but the beds so far discovered are thin and apparently have never been worked or developed to any extent. Copper, silver, and gold have been found; also rock salt and nitre near the coast. Iron is in great abundance in Imérina and other parts, sometimes nearly in a pure state; in Bétsiléo and other provinces it is on or near the surface. Iron pyrites is found in abundance. Antimony is plentiful in the northern parts of the island. Oxide of manganese has been found 50 miles South of the capital. A substance resembling plumbago exists in great abundance; it is used to colour and glaze pottery. A variety of ochres and coloured earths are also met with, and are used by the natives for colouring houses and dyeing cloths.

Timber, &c.*—There are belts of forest round the island, the combined length being about 2,300 miles, on ground varying from near the sea level to 6,000 feet above it. There are many hard woods similar to mahogany, satin-wood, teak, and ebony of superior quality; also a great variety of woods suitable for all kinds of building and cabinet work; a kind called *vóambóano* is very plentiful, with great variety of colour and veining. The *varónge* is largely used for rafters and for canoes; the three central posts of the palace at Antananarivo, are each formed of a single trunk of this tree, and are 120 feet above the ground, besides a considerable depth below. In the south-eastern forests, many trees are of great girth, owing to their being buttressed round the trunk with aerial roots; each hollow between these buttresses forms a chamber large enough to enclose several people. India-rubber trees grow in forests in the southern and south-western districts. The *pandanus* has several species, the most common with branching head and high roots is found in dense masses, especially on the eastern side of the island; sugar bags are made of the long tough leaves, also water-tight coverings, and plates and dishes by the poorer people. The

* See Notes on a botanical trip in Madagascar by G. F. Scott Elliot, published in the proceedings of the Royal Geographical Society, March, 1891.

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flao (casuarina) or beef-wood tree is seen occasionally near the coast ; it is tall and graceful with foliage, but not the wood, resembling the fir. The *atáfa* is a large tree, remarkable from the branches growing horizontally ; the leaves are 8 or 10 inches in length, and always partially ruddy, brown, or scarlet. The *vóavóntaka* is common ; it grows to the size of an apple tree, and bears a yellow refreshing fruit. The *tangina veneniflua* occurs frequently in the woods ; it produces a nut, from which the famous poison *tangin* is extracted ; it is about the size of a cherry tree, and has glossy green leaves. Certain kinds of *hibiscus* are also found near the coast, from the bark of which twine and cordage are manufactured. The aleurites or candle-nut also is found. Some varieties of rose-wood (*manary*) grow freely.

The *baobab* tree, called *bontóna* or monkey's bread, is plentiful on the West coast, and remarkable for its enormous trunk, which is frequently 20 or 30 feet in diameter ; it has a small spread of branches and dark brown shining bark. The tamarind (*hazo madiro*) is plentiful ; it attains a great size on the banks of the chief rivers ; the *hymenaea courbaril* furnishes the soft Brazilian copal (*mandrorofo*) ; indigo (*ingitry*) is also plentiful. A wild vine, *euphorbiacées* (*vahea gummiifera*), grows in abundance in the woods, producing caoutchouc of excellent quality. Cotton is produced by two species of shrubs. Also the saffron of India (*tomotamo*), the castor-oil plant, the Indian nut, and badamier trees.

Of palms and bamboos there is great variety ; the cocoanut is but sparingly scattered on either coast ; the fan palm or traveller's tree is very plentiful ; a cup of water may be obtained from it by piercing or breaking the stem of a leaf ; the *anivona* often grows by its side, both attaining a height of 80 or 100 feet ; the bark of the former is one of the toughest vegetable substances known ; it is used for building houses and fastening the planks of boats. The sago-palm is common, but not used by the natives. The rofia palm (*sagus ruffia*) is both plentiful and useful ; it is found in profusion in the plains a few hundred feet above the level of the sea. The trunk is from 30 to 50 feet high, the head divides into 7 or 8 leaves, the mid-ribs form light, strong, and straight poles, about 20 feet long, 5 inches in diameter at the base, and half that size at the end. They form the framework for the roofs of houses, and are used for rafters, ladders, carrying poles for palanquins, and other purposes. From the inner fibre of the fine pinnate leaves are woven a variety of strong and beautiful cloths. From the common bamboo, rafters, carrying poles, water-pots, &c., are made. A small description is a climber, and sometimes spreads from tree to tree. The fruit of the *satra* palm is eaten, and the leaves serve to make mats. The forest trees are bound together in all directions by countless creepers crossing and entwining

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in an inextricable tangle; some of these, without any preparation, take the place of really strong cordage, and are largely used for securing goods and packages.

Madagascar is prolific in spiniferous and prickly plants; one description, *tsiáfakómbi* or “not passable by oxen,” is used for cattle fencing. The widely-spread prickly pear is of some service for food, and forms the chief defence of Malagasay towns and homesteads; its needle-like thorns are between two and three inches long, and wounds inflicted by them inflame and are often difficult to heal. There are a variety of grasses, some prickly and troublesome, others of a bright crimson colour; they are interwoven in patterns for mats, clothing, and other purposes. In some districts the grass grows to a height of seven or eight feet. Reeds and rushes are also useful; the *zozoro*, a species of papyrus, has a triangular stem about an inch and a quarter in size each way, and grows to a height of five or six feet. Gourds of various shapes and sizes are applied to many uses in lieu of basins, jars, and bottles. Tobacco, indigo, flax (of very superior quality), and hemp are also grown, but the quantity might be greatly increased. Flowers are rather scarce, but many flowering trees are magnificent.

Edible vegetables.—Rice is the principal article of food; 11 kinds are grown in various parts. Cassava is largely cultivated; also sweet potatoes, several kinds of beans, tomatoes, ground nuts, onions, tapioca, and arrow-root; the green leaves of many vegetables are also eaten. In the warmer parts, there is a variety of yams, some kinds growing wild; a root called *faungidge*, eaten raw, is found of great size; the inside is white with a milky juice and as soft as a melon. Millet is grown, but wheat has only quite lately been cultivated successfully, and with the aid of European implements its culture will largely increase. Several kinds of arum (*horirika* and *sáonjo*) are cultivated, and sometimes grow to a height of 10 feet; the fruit and root are eaten when cooked. Coffee grows well; several plantations have been formed on the eastern side with fair prospects of success. Sugar-cane, in 14 varieties, grows luxuriantly, especially in Antsiánaka province, where it attains a height of 12 or 14 feet. Good sugar is produced at Tamatave; and, in some places, a coarse spirit called *zóaka* is made of the sugar-cane. Chillies (*sakáy*) grow abundantly in places; ginger (*sakamaláo*) grows wild and is also cultivated. A spice, combining the virtues of nutmegs, cloves, and cinnamon is procured in the warmer parts from a magnificent tree called *rávintsára*, of which the leaves, as well as the fruit and seeds, are fragrant. Capsicums and turmeric grow wild.

Fruit.—Of juicy sub-acid fruits, oranges, citrons, lemons, and limes abound; these last grow wild in the warmer parts. Mangoes are among the finest of fruits, and the tree one of the most ornamental;

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it attains the greatest size on the north-western coast about Mojanga. Peaches, guavas, Chinese guavas, *bibásy* or loquat, pine-apples, mulberries, pomegranates, grapes, and Cape gooseberries are also grown. Bananas are plentiful; the largest variety, called *óutsy*, are more than a foot long. Figs and quinces are grown to some extent. Near the woods, wild raspberries have been found in abundance, very large and fine. Besides the above are numbers of wild berries and fruits.

Animal life.—The absence of many animals and birds usually found in tropical countries, and especially in the adjoining African continent, is very remarkable. Humped cattle are found in great herds, and numbers are shipped to Africa to supply the deficiency caused by rinderpest; no such thing as contagious disease amongst cattle being known in Madagascar. Hairy sheep are plentiful, but fat-tailed sheep and goats are scarce. The river hog is the only representative of the hippopotamus and rhinoceros, but there are herds of wild boar in the forests. Crocodiles swarm in every river and lake and even in many small pools; they are never found in brackish water near the coast. In the Bétisibóka, a hundred crocodiles have been seen in a day; one which was killed measured 23 feet, the ordinary length being about 15 feet. Many places at river sides are fenced off to protect people when drawing water. The few horses and asses on the island are recent importations. Civet cats are numerous, and very destructive to domestic fowls. Rats and mice abound, also dogs and cats, both wild and tame. Lemurs are common in the woods; they have the agility of monkeys, but the head is more like that of a dog or a fox, with large eyes; the fur is thick and soft; they are of great variety in size and colour, varying from three or four feet in length to the size of a rat, and from glossy black or brown to dark red or white. Of baboons there are two varieties, and there are said to be three kinds of monkey; the former are called by the natives *tratratrata*. There are foxes, brown and grey squirrels are numerous, and a large winged bat is found in many parts of the island. There are several kinds of hedgehog (*trándraka*); some are used as food and taste like pork. There is a description of badger found in the western provinces, also several species of tortoise. Bees are numerous; honey and wax are abundant near the forests.

Birds.—Hawks, kites, falcons, crows, and owls abound; there are also a few eagles. There are guinea-fowl, quails, grouse, partridges, pea-fowl, snipes, curlew, bitterns, flamingoes, storks, and spoonbills; also wild ducks, divers, teal, muscovy ducks, water-hens, sandpipers, herons, white egrets, storks, the crested ibis, black geese, and the grebe.

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Of perching birds, there are parrots, slaty black and bright green; the former easily learn to talk. In the warmer parts of the island flocks of bright green parroquets are to be seen, and cookoos are common. Of cardinal birds there are several species; in one, the size of a lark, the male birds are a brilliant scarlet, while the females are brown like a sparrow. There are no humming-birds, but sun-birds or sugar-birds are very similar. There are thrushes, warblers, bulbuls, orioles, fly-catchers, hoopoes, pigeons, goat-suckers, king-fishers, flower-peckers, weaver-finches, wagtails, rollers, bee-eaters, pittas, swallows, and swifts.

The best district for a sportsman is the province of Tamatave, near Lake Alaotra, in the valley between the two eastern lines of forest. One of the greatest curiosities is the egg of the *Æpyornis* (now extinct), found at the southern end of the island; it measured $12\frac{1}{4}$ inches in length by $9\frac{3}{8}$ inches in diameter.

Reptiles and insects.—There are desert-snakes, tree-snakes, whip-snakes, and boas; those found in the interior and upper forests are not venomous, near the coast they are. Also lizards, several species of chameleons, and tree-frogs. There are two species of silk-worm, of which one spins very strong silk. There are many species of locust; in 1869, a cloud of them passed over the capital, darkening the sky during their passage for more than an hour. Spiders are very large and numerous; centipedes are common, and scorpions not uncommon. Mosquitoes are an intolerable pest, especially in the low country; there is also a stinging fly which attacks during the day.

Fish are abundant round the coast, but not in the inland waters generally, except eels of large size and excellent quality: Lake Itasy, however, is said to be an exception. The vile superstition which has hitherto preserved crocodiles may well have destroyed the useful creatures, which might otherwise have lived and flourished in the rivers and lakes.

Industries.—Native gold and silver-smiths are skilful, beautiful specimens of stamped silver being obtainable at a cheap rate; they also imitate European jewellery with exactness. Workers in iron, copper, brass, tin, and pottery are skilful, though their modes are primitive. The principal produce of native industry consists of knives, spades, pottery, bricks, tiles, sugar, soap, candles, furniture, beautifully fine plaited mats, hats, and baskets; rofia, curtains, silk lace and *lamba*.

Industrial schools, giving excellent results, have been established under the new government for tuition in various modern trades and industries.

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The *lamba* is a piece of cloth about 3 yards long and 2 yards wide, woven of silk, cotton, hemp, banana, or rofia palm fibre; it is made extensively for domestic use, being worn by both sexes, and also for sale. In these stuffs, stripes are largely employed, the colours being obtained from vegetable dyes and coloured earths. The most striking examples of native design and variety of pattern are seen in silk *lambas*; some of the dark red *lambas* worn by chiefs have fine metal beads woven into the patterns.

The Bétsiléo tribe evince considerable skill in elaborately carving their burial memorials, dwellings, and household utensils; the designs resemble those used in Polynesia. The mechanical power of the Bétsiléo is shown by their quarrying and removing to their tombs immense slabs of stone; one has been measured 18 feet in length, 10 feet wide, and nearly 3 feet thick.

Coarse looking but strong rope is made at Antananarivo from the fibrous bark of certain trees, especially that of the *astrapœa cannabina*, and finer rope with hemp.

A reddish-brown dye is obtained from the bark of a large forest tree called *naio*. Another dye is extracted from a lichen (*orseille*), which grows in the sterile parts at the south-western end of the island. Indigo (*aika*) also is cultivated, but to no great extent. Mulberry leaves are used in the low country for feeding silkworms, but in the interior the leaves of a small tree, called *topia*, supply their place. Tobacco is grown in a few places, and snuff and cigars are manufactured.

Mining is in its infancy. Gold was discovered in the old province of Imerina about the year 1885, and alluvial gold is to be found all over the island in more or less payable quantities. From that time to 1896, a considerable amount of alluvial gold was exported from Majunga, Mananzari, and Tamatave; as also by Arab-Indian traders from the less-known south-western ports. It has been computed that about 3,600 oz. were dispatched monthly from the three ports named prior to the French annexation. Since that event, a great deal of land has been taken up or "pegged out" under the French mining regulations, and the amount of gold produced in 1910 was 104,002 oz., of which more than 35 per cent. was produced in the northern province of Diego Suarez.

Trade, &c.—The total amount of imports into Madagascar during the year 1910 was £1,337,477, of which France and French colonies imported 90 per cent. In 1910 the total exports were £1,817,531, of which 65 per cent. were exported to France and French colonies. The number of vessels that entered Malagasy ports in 1910 was 11,014, of a total tonnage of 1,492,874 tons, the proportion being 79 per cent.

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French, 13 per cent. British, and 8 per cent. other nationalities. The currency of the island is now French.

Barometer.—Thermometer.—Rainfall.—At Tamatave, 11 feet above sea level, the mean height of the barometer for 7 years was 30·06 inches, and the range from 30·41 in July to 29·18 in January. At Majunga for a period of 3 years prior to December, 1893, the mean height of the barometer was 30·00 inches. At Tamatave in 10 years the mean temperature was 76°, the actual maximum recorded being 103° in June and the minimum 55° in July and October, but there is a range of from 29° to 46° in monthly temperature throughout the year. At Farafangana the mean temperature for 3 years was 75°, the mean maximum being 88° in January, and the mean minimum 60° in July. At Nosi Bé the mean temperature for three years was 80°, the mean maximum being 87° in December, January, February, and March, and the mean minimum of 72° in July and August. At Majunga for a period of 3 years prior to 1894 the mean temperature was 80°, the maximum recorded being 99° in November and the minimum 60° in January. During the same period at Antananarivo the maximum was 86·5° and the minimum 40°

At Tamatave for a period of 11 years the wettest months were from January to July, when rain of from 9·7 to 17·9 inches fell in from 15 to 18 days, but the maximum fall for 24 hours was 7·9 inches in August; the mean fall for the period of 11 years was 122·8 inches in 182 days. At Farafangana for a period of 3 years the wettest month was March, with 23·17 inches, and the driest October with 3·6 inches; the mean fall for that period was 121·3 inches in 187 days. At Fort Dauphin for a period of 3 years the wettest month was March with 8 inches, and the driest November with one inch; the mean fall for that period was 50·1 inches in 105 days. At Nosi Bé for a period of 5 years the wettest month was February with 20 inches, and the driest July with one inch; the mean fall for that period was 90·1 inches in 106 days. At Majunga, prior to 1904, the rainfall for 16 months was 65·6 inches in 76 days, and at Antananarivo for the same period 59·1 inches in 108 days.

The island of Madagascar generally is subject to a heavy rainfall, but more so on the eastern than on the western side; and only in a small portion of its south-western part is the fall ever deficient.

On the eastern coast, from Antongil bay southward, though the rainy season is from December to April, there is scarcely a day in the whole year without a shower. At Diego Suarez there is much rain from December to April, but little during the S.E. monsoon, at which time the country wears a desolate appearance. Near Tamatave, the driest months are September, October, November, and part of December.

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Climate.—The rainy is always the *hot* season, and the *dry* the *cool* season. The heavy rains and consequent overflow of the rivers inundating large tracts of country every year, are doubtless the cause of the insalubrity of the climate. The malaria in marshy places appears to affect natives from other parts of the island as well as foreigners. The most unhealthy parts along the coast and for some miles inland, until the land attains some height, are between Antongil bay and Fort Dauphin. The western and north-western coasts are decidedly more healthy. As the higher lands of the interior are reached, the climate improves, and the province of Imerina, with the exception of some marshy valleys, is reputed to be healthy and exempt from fever to new comers after a short period of acclimatisation.

Currents on Eastern coast.—Between Tamatave and Fort Dauphin the French vessel of war *Hugon* found a current setting S.S.W. parallel with the coast at all seasons, whatever the prevailing wind. Between Tamatave and Vatomandri, its rate was about one knot; from thence to Mananzari it attained a rate of $1\frac{1}{2}$ knots; between Mananzari and Vangaindrano, 2 knots; and in the vicinity of Fort Dauphin, $2\frac{1}{2}$ knots. These rates were slightly influenced by the existing winds.

Between Tamatave and Cape Amber, during the South-east monsoon, April or May to October, a weak northerly current was found up to St. Mary, increasing gradually to $2\frac{1}{2}$ knots, and even 3 knots from the Leven islands. In July, August, and September, the rate of the current northward of Tamatave was in general proportional to the force of the monsoon, the direction of which it followed. It attained a rate of $2\frac{1}{2}$ or 3 knots where the monsoon is strongest, which comprises a distance of about 90 miles both North and South of Diego Suarez.

On the eastern side of Amber peninsula there is a general set of the current to the north-westward, but during the winter months it is sometimes overcome by the tidal stream, which causes a set to the southward for the first 2 hours after high water. During the monsoon the strength of the current is largely increased, and, in conjunction with the tidal stream, it attains a strength of 3 or 4 knots off Cape Amber, and at half flood it has been found to reach 5 to 6 knots in one place.

Between Tamatave and Vohemar, in the closing months of the year, when N.E. winds are prevalent, and during the season when the winds are very variable, the *Hugon* found a current of more than one knot setting southward with a N.E. wind, but in varying directions according to the existing wind. From Vohemar northward, irrespective of the wind, a northerly current was always found,

Chart 597, Delagoa bay to Cape Guardafui.

strengthening in proportion as Diego Suarez and Cape Amber were approached. With the N.E. wind, the current is weaker, running about one knot.

Between the Antongil peninsula and St. Mary, a secondary current was traceable, always setting westward towards Antongil bay; though weak, this set should be taken into account when passing this locality at night.

For currents on other coasts of Madagascar, *see* pages 21-23.

Communications.—Under the Hova rule, there was a total absence of wheeled traffic or roads throughout the island, the natives having an idea that roads would assist invaders; therefore, there were foot tracks only, and this is still the case over the greater part of the island, so that travellers have still to be carried in open palanquins, and merchandise or goods for most parts in the interior have still to be borne on the shoulders of porters, many of whom have wonderful powers of endurance, and have been known to travel 200 miles in four days over very rough mountainous country.

These primitive methods have, however, given way to modern conveniences. The government has constructed several excellent roads, and there are now (1911) 1,100 miles of metalled roads in Madagascar. There is a fortnightly service of motor-cars, for transport of mails and passengers, between Antananarivo and Miarinarivo, the capital of the province of Itási, 61 miles; and a service—twice weekly—between Antananarivo and Ambositra, the capital of the province of that name, a distance of 166 miles; also a monthly service between Antananarivo and Maevatanana, 214 miles.

A canal connects Ivondrona with Andovoranto and Brickaville. There is a regular service of small steamers on it.

Railways.—A line is constructed from Brickaville to Soanivana, a distance of 165 miles, whence motor-cars and other vehicles take passengers to Antananarivo, which is only $2\frac{3}{4}$ miles distant. A line is being constructed to connect Tamatave with Brickaville, and when it is completed the journey from Tamatave to Antananarivo, which now occupies two days, will be completed in one day. A steam tram runs from Tamatave to Ivondrona, a distance of 6 miles, and one from Antsirana, Port Nièvre, to Sakarami for Camp d'Ambre, a distance of 14 miles.

Telegraphic communication.—In 1910, lines extended from Antananarivo through Andovoranto and Maroantsetra to all the principal places on the east coast; to Majunga and Maintirano on the west coast, and through Betroka to Fort Dauphin on the south coast and Tulléar south-west coast.

Antananarivo is in telephonic communication with Tamatave.

Chart 597, Delagoa bay to Cape Guardafui.

A submarine cable runs to Majunga from Mozambique, and one to Tamatave from Réunion and Mauritius.

Majunga is in wireless telegraphic communication with Mayotta and Johanna, Comoro islands.

The inland postal service is continually expanding, and a parcels post, by which parcels can be sent to all important towns in the interior, has been organised.

Canoes propelled by paddles and formed from the hollowed trunks of trees are still employed on the rivers; the largest are 40 feet long and nearly 3 feet wide and deep. In the south-eastern part of the island, rafts made of the papyrus are used for crossing rivers; but at the rivers' mouths, and for going off to vessels, boats 30 feet long and 8 feet beam, propelled by large oars, and capable of carrying 50 people, are used; they are built of planks, fastened together by cord made of palm fibre, strips of bamboo being used to caulk the seams. On the north-western coasts, canoes with outriggers, 5 feet long on each side, are much used and skilfully managed; they are 26 feet in length and only 25 inches wide, with a raised platform in the centre; with a stiff breeze they will sail 12 miles an hour.

Time.—Madagascar keeps time of the 45th meridian East, or 3 hours fast of Greenwich mean time

For Mail Services, *see* pages 24, 25.

NORTH-EAST COAST OF MADAGASCAR.

Chart 1002, Diego Suarez to Andranoaombi bay. Var. 5° 50' W.

CAPE AMBER, the northern extreme of Madagascar, consists of three points, of which the central projection is scarcely more salient than the others; each point is low, rocky, jagged, and bordered by islets. The central point is the termination of a large regular plain of moderate height, but having a naked and parched appearance in consequence of the strong sea breeze blowing over it unceasingly during six months of the year, and the land is said to be uninhabited as far southward as the shores of Diego Suarez bay. The hills in the vicinity are flat-topped, and from 300 to 700 feet high; they can be seen 15 or 20 miles distant in clear weather. The point a little south-eastward of Cape Amber, is low, rocky, and formed of hollow cylindrical columns of madrepore.

LIGHT (*Lat. 11° 57' S., Long. 49° 18' E.*).—On the easternmost of the three points forming Cape Amber, stands a cylindrical iron tower, 108 feet high, from which is exhibited, at 213 feet above high water, a *white flashing* light, visible 20 miles, and showing its flash *every five seconds*. When the apparatus is disabled, this light is pro-

General charts 758, 597, 2899, 748a, b.

Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 5° 50' W. visionally replaced by a small *white fixed* light. For arcs of visibility of both lights, *see* Light list and charts.

Signal station.—An International code signal and telegraph station has been established at Ambohitramporia point, about 13 cables to the westward of Cape Amber lighthouse, its distinguishing letters being A.M.D.R.

The depth on both sides of the rocky islets off the cape is 14 fathoms; at 5 cables outside or northward of them there are from 20 to 25 fathoms, and at 2 or 3 cables only off the middle point, where the bottom may be distinctly seen in passing, there are 10 fathoms.

Directions.—To round Cape Amber from West to East requires care during seven or eight months of the year, from April to November, the current then attaining, in conjunction with the tidal stream, a rate of from 3 to 4 knots, and at half flood it has been found to reach 5 to 6 knots in one place; the S.E. monsoon often also blowing with great strength, a short, choppy, and very rough sea ensues, but both current and sea are much reduced the nearer the cape can with safety be approached.

The *Hugon* frequently made the passage without difficulty during the worst season by passing within 2 or 3 cables of the rocky islets.

To round the cape, under steam, a vessel should be in its vicinity at daybreak, hug the shore of the islets as described, and avoid being set out into the strength of the stream and sea, where she would lose ground and without great steam power might fail to reach Diego Suarez before night.

Low-powered steamers, if attempting to round the cape with the wind and current against them, should do so during the first 2 hours after high water, close to the land, and at night.

When passing from East to West, the breeze falls directly the vessel has passed the cape, and though squalls and swell may follow for a few miles, they are soon succeeded by calms or baffling winds.

Tidal stream.—From a position a little west of Cape Amber observations were made for six days, in March, and it was found that the stream generally runs to the N.E., and is at its maximum one hour after high water, attaining at that time the rate of $2\frac{1}{4}$ knots; the stream runs south for one hour at the time of low water; its strength being half that of the northerly stream; the turn of the stream is almost instantaneous, there being no slack water.

The following is the result of observations of the combined current and tidal stream made in February, 1907, at a position one mile S.E. of Cape Amber: At low water, N.W. $\frac{1}{2}$ N., rate 2 knots; one hour after low water N.W. $\frac{1}{2}$ N., 2 knots; 2 hours after low water, N.W. $\frac{1}{2}$ N., $2\frac{2}{10}$ knots; half flood, N.W. $\frac{1}{2}$ N., $2\frac{7}{10}$ knots; 4 hours after low water, N.N.W. $\frac{1}{2}$ W., $2\frac{8}{10}$ knots; 5 hours after low water, N. by W. $\frac{1}{2}$ W.,

General charts 758, 2762, 2899, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoaomby bay. Var. 5° 50' W.
1 $\frac{1}{10}$ knots. At high water, North, rate half a knot; one hour after high water, S. by E., one knot; 2 hours after high water, S.S.W. $\frac{1}{2}$ W., 1 $\frac{1}{10}$ knots; half ebb, W.S.W., 1 $\frac{3}{10}$ knots; 4 hours after high water, W. $\frac{1}{2}$ N., 1 $\frac{1}{10}$ knots; 5 hours after high water, N.W., 2 $\frac{2}{10}$ knots.
Plan 1116, Diego Suarez bay.

Andramaimbo (*Windsor castle*). — **Signal station** (*Lat. 12° 13' S., Long. 49° 11' E.*).—This is a conspicuous conical hill, rising to a height of 1,289 above the sea from a level ridge on the neck of land separating Diego Suarez and William Pitt or Andramahiba bays; it is a conspicuous landmark, visible many miles on each side of the island; it is about 12 miles W. by N. from the entrance of Diego Suarez; from the eastward, it assumes the form of a mitre. A signal staff is placed at its summit, visible from the sea for the purpose of informing the authorities at Port Nièvre, Diego Suarez, of all vessels sighted on the western coast.

Ankaramisampana (*Dover castle*) is another remarkable hill, 892 feet high, on the same ridge, and about 2 miles East from Windsor castle.

Chart 758, Cape St. Andrew to Antongil bay.

Mount Amber (Ambohitra) is the highest and most conspicuous object near the northern end of Madagascar, being seen from either side. It has three peaks; the highest, at the northern end of a range about 12 miles long, is about 37 miles S. by W. $\frac{3}{4}$ W. from Cape Amber; it rises 4,455 feet above the level of the sea, with a very regular acclivity; its sides are covered with thick forest. In moderately clear weather it is seen long before the intervening land.

Chart 1002, Diego Suarez bay to Andranoaomby bay.

Coast.—From Cape Amber to Diego Suarez bay, the general appearance is that of an assemblage of naked mounds or peaks, high and regular, without any distinguishing features, except, perhaps, Ambohibiri peak or La Poule, which is 722 feet high, lies about midway between Cape Amber and Diego Suarez bay, and is about 2 $\frac{1}{2}$ miles inland; the ground is parched, except during a part of the winter. There are a few small bays, too exposed to be of any value. A reef borders the coast at a short distance, until within 5 miles of the entrance to Diego Suarez bay, where it spreads out and surrounds a group of bare islands; the northern one, Nosi Anteli-bé (Nosi Antali), is 125 feet high, and lies about one mile from the coast; Suarez island (Nosi Anteli), 82 feet high, and Diego island (Nosi Lava), 36 feet high, lying close together, are the southern ones, the latter is E.N.E. a distance of 2 miles from Cape Tanifotsi. The sea breaks with great violence on this reef during the S.E. monsoon, i.e., from May to November.

General charts 758, 762, 2899, 597, 748a, b.

Plan 1116, Diego Suarez bay. Var. 6° W.

Mahajebi bay is within the islands and reefs just mentioned, the entrance is about $3\frac{1}{2}$ miles northward of Cape Tanifotsi, and about one mile wide, with an islet, Nosi Toreki, in mid-entrance. There is a depth of from 10 to 20 feet in the entrance, but inside the bay it shoals rapidly, with many sand and coral patches dry at low water. A wreck lies on the outside of the reef, which dries from one to $1\frac{1}{2}$ feet at low water, and connects Diego island with Nosi Volana.

DIEGO SUAREZ BAY (*Lat. 12° 13' S., Long. 49° 19' E.*).—This magnificent sheet of water, called Antomboka by the Malagasies, enclosed by thickly-wooded land, generally about 260 feet high, comprises within its limits four smaller bays, and may be considered one of the finest harbours in the world. Unfortunately, its position at the extreme end of Madagascar, with no river communication, seriously interferes with its commercial development, but the removal of the French naval base from Réunion to Port Nièvre in 1900 has increased its commercial importance. Cattle rearing has greatly increased, as has also the cultivation of the surrounding country.

The four inner divisions of the bay are named as follows:—the first, on the northern side, is Andovokaratra bay, Irish bay, or Baie du Tonnerre; the next is Andovobatofotsi or English bay; the northern inlet of this is called Tsiala bay, and the south-western Andohazampo cove. Andovobazaha, Scotch bay, or Baie des Français, is the first on the southern side of the entrance, beyond which is Port Nièvre, leading to the Cul-de-sac Gallois or Welshpool.

Wind and Weather.—From November to May (rainy season) the wind blows principally from the S.E., but with a less force than during the monsoon, sometimes, but very rarely, there is a light breeze from N.E. or West. About February there are squalls at night, calms in the morning, and light winds during the daytime. In March there are a few westerly winds, and the S.E. winds are light. From November to March gales are frequent. The periods of calm generally come together for 3 or 4 days, and in the same way the bad weather.

About the end of April the S.E. monsoon is established, the temperature becomes bearable, and storms less frequent. From May to November, the monsoon continues, and it becomes particularly dry and cool during June, July, and August. The wind inside the bay commences about 8 a.m., acquires its greatest strength about 10 a.m., decreases about 4 p.m., and is moderate at sunset. Sometimes it freshens during the night, but every morning during about five hours there is either a calm or a light air from S.S.E. or South. At that season, the evenings, nights, and forenoons are cool, and during the rest of the day the heat is bearable.

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1116, Diego Suarez bay. Var. 6° W.

Climate.—Diego Suarez is one of the least unhealthy places on this coast, and different parts of the bay vary in point of salubrity according to circumstances, and especially according to the nature and height of the ground. Marsh fever, so fatal to Europeans in Madagascar, is less frequent than at other places on the coast. Dysentery is not common, and rarely assumes a formidable character. The dry season is healthy, and acts as a tonic on those prostrated during the hot weather. The temperature in the shade during the hottest months exceeds 93°; at night, it is from 84° to 86°. During the dry season, the mean temperature is 77°, and always tempered by the strong south-easterly wind.

Approach.—Mount Amber, though a most remarkable and excellent landmark, as already described, is frequently hidden by clouds, but a vessel approaching from the south-east will probably sight Thumb mountain, some 45 miles southward of the entrance to Diego Suarez bay, appearing over the hollow of the land at Port Looké; this mountain is most remarkable, rising in the form of an eagle's beak with a deep cut on its right side; when bearing northward of West, and clear of the hills behind, it is still more conspicuous. Farther northward, near the coast, 16 and 12 miles respectively southward of the entrance, are Mount Raynaud, or Andrambé, 1,312 feet high, and Square Mountain, or Ankarakatova, 1,263 feet high, both very remarkable and generally to be seen. These, with Mont des Francais, 755 feet high, overlooking Andovobazaha bay within the harbour, and Dundas island, a sugar-loaf 400 feet high and covered with bushes within that bay, seen over the low land northward of Mont des Francais, as the entrance is approached, all form excellent guides for fixing a vessel's position.

Cape Andranomodi is more easily recognised than the lighthouse eastward of its northern extreme, above which latter, Windsor Castle, 12 miles distant W. by N. from the cape, will be seen.

Approaching from the northward the entrance is not so easily recognised, Nosi Volana masking Cape Andranomodi, so that the opening between Nosi Volana and Cape Tanifotsi might be mistaken for the entrance but for the beacons on Nosi Volana and the lighthouse on the southern side of the entrance. Cape Andranomodi has a red appearance when seen behind the above Nosi Volana.

The land near the sea coast at this part is generally well wooded.

Nosi Angongo (York island) (*Lat. 12° 15' S., Long. 49° 24' E.*), 49 feet high, is rocky, bare, and fairly steep-to; it lies about 1½ miles southward of the entrance to the bay.

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1116, Diego Suarez bay. Var. 6° W.

Dangers.—**Le Grand banc** extends for a distance of about $3\frac{1}{2}$ miles, north-eastward, from Baie d'Ampio, a small indentation of the coast about 7 miles southward of the entrance to the bay. There are depths of $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms over this bank.

Banc N.E. is a detached head with $5\frac{1}{4}$ fathoms over it; it lies about $1\frac{1}{4}$ miles northward of the outer extreme of Grand banc, and is situated at a distance of $3\frac{4}{10}$ miles E. by S. $\frac{1}{2}$ S. from Nosi Angongo.

Banc de L'Ivonne is a detached coral head with $7\frac{1}{2}$ fathoms over it, and is situated at a distance of 2 miles E. $\frac{1}{2}$ N. from Nosi Angongo.

These two detached heads are on the outer edge of the bank which extends eastward from the coast southward of the entrance to the bay.

Clearing mark.—Ambohitivi peak in line with the summit of Suarez island, bearing N. 39° W., leads eastward of the shoals.

Depths.—The least water on the leading marks entering the bay is from 7 to 8 fathoms; inside the bay there are from 20 to 30 fathoms, shoaling gradually in all directions into the four smaller bays.

Plan of Oronjia pass on 1064.

The entrance (Lat. $12^\circ 14'$ S., Long. $49^\circ 23'$ E.), about 18 miles southward of Cape Amber, is upwards of a mile wide between Capes Tanifotsi or Patrimonio point and Andranomodi or Miné point, but is divided near the centre by Nosi Volana, or Clarence island, on which is a battery; the island is 98 feet high, wedge-shaped, and sloping towards the sea, with the funnel of an old gunboat, painted with black and white horizontal bands, erected conspicuously as a beacon on its northern part, and on its south-eastern coast a beacon of masonry, which is not very conspicuous. A reef connects this island with Cape Tanifotsi, and also extends 2 cables to the southward of the island, leaving a clear passage between it and Cape Andranomodi, called the Oronjia pass, 4 cables wide between depths of 4 fathoms on either side, with from 22 to 26 fathoms in mid-channel.

Tidal streams.—The tidal streams in the Oronjia pass run from one to $2\frac{1}{2}$ knots. Inside the entrance the flood stream makes from about half an hour before low water at Port Nièvre until about half an hour after high water at that place.

Outside the entrance the following observations were made at springs: At low water, southward of the entrance, stream sets towards the entrance; northward of the entrance, sets towards Cape Amber; one hour after low water, southward of entrance, it is slightly deflected towards Ambodi Vahibé bay; half flood, sets directly into the entrance

General charts 758, 2762, 2899, 597, 748a, b.

Plan of Oronjia pass on 1064. Var. 6° W.

along the coast, from Port Ambavarane, the rate in the entrance being $2\frac{1}{2}$ knots. At high water, off the entrance, both north and south, the stream is very weak; in the entrance there is still a stream flowing in at the rate of a quarter of a knot; one hour after high water it sets out of the entrance at the rate of a quarter of a knot; northward of the entrance it sets down the coast, and southward of the entrance about S.E.; at half ebb, out of the entrance to E.S.E., at rate of $1\frac{1}{2}$ knots, being slightly deflected to the northward and southward on leaving the coast.

Cape Andranomodi (Miné point) is 115 feet high, the land one mile behind it rising to a height of 394 feet. To maintain communication with Port Nièvre, there is a signal and telegraph station on Oronjia point, its north-western part; vessels can communicate by International code; the call letters are A.M.D.U.; also a battery between it and the lighthouse. This cape appears to have changed in form since the survey by Captain Owen, the land having slipped away, leaving a number of detached rocks in the sea; one large black rock is especially prominent. Just southward of this reef there is a stone pier running off a few yards in the direction of Nosi Langor.

Nosi Langor.—At 3 miles westward of the southern end of Nosi Volana is Nosi Langor or Ile des Aigrettes, 33 feet above high water, flat, and surrounded for 150 yards by coral reef, with a $2\frac{1}{2}$ -fathoms patch 2 cables S. by E. from the rock.

LIGHTS.—Cape Andranomodi (Miné) (*Lat. $12^{\circ} 14' S.$, Long. $49^{\circ} 23' E.$*).—On the south-eastern point of entrance and 1,300 yards S.E. by E. $\frac{1}{2}$ E. from the North extreme of Cape Andranomodi, stands a masonry lighthouse 26 feet high, but from its sandy colour not easily distinguishable by day, from which is exhibited, at 124 feet above high water, a *white group-flashing* light, showing groups of three flashes every fifteen seconds, visible from a distance of 14 miles.

On Nosi Langor, from a grey rectangular house of masonry, at 57 feet above high water, is exhibited a *fixed* light, showing *green white*, and *red* sectors. The *white* leading sector is visible from a distance of 11 miles, the *green* 3 miles, and *red* 4 miles. For sectors, see Light list and chart.

Oronjia.—About half a mile south-westward of Cape Andranomodi stands the village Oronjia. There is a well-sheltered anchorage off Oronjia village, with Nosi Langor in line with Bobaombyvatobe bearing N. 69° W., and the summit of Dundas island in line with the extremity of the trees on Hope point, bearing S. 28° W.

General charts 758, 2762, 2899, 597, 748a, b.

Plan of Oronjia pass on 1064. Var. 6° W.

Hope point (Pointe des Sables) is a low point of sand, bordered by a thick screen of fine trees. About 3 cables northward of Hope point is a long wooden jetty, at which a steam launch can land at low water.

Oronjia bank.—From Oronjia village point, or Pointe de l'Aigle, to one mile south of Hope point, shoals extend from 5 to 7 cables from the coast, and the Oronjia bank, which is a continuation of these shoals, has a depth of only $3\frac{1}{4}$ to 4 fathoms at a distance of one mile from the coast. The leading line through Oronjia pass leads to the northward of the bank, and Port Nièvre lighthouse, bearing S. 54° W., or at night the *white* sector of Port Nièvre light, leads to the westward. Two leading beacons for clearing this shoal still exist northward of Cape Tanifotsi, but they are no longer used.

Plan 1116, Diego Suarez bay.

Andovobazaha (Scotch bay, Baie des Francais) lies between Hope point and Tenre Hanga; it is about 3 miles deep, and its shores are fringed with coral reefs. At its head is the conspicuous range of hills, Mt. des Francais, and in the S.W. corner is the very conspicuous Dundas island or Pain de Sucre, so called from its sugar-loaf shape. On the eastern side of the bay is the village of Ankorika.

Excellent anchorage may be found in the bay, outside the 5-fathom line, with good holding ground of mud, and well protected, especially during the S.E. monsoon.

Plan 1064, Port Nièvre, &c.

PORT NIÈVRE (Lat. $12^{\circ} 16'$ S., Long. $49^{\circ} 18'$ E.), so named from the French corvette by which it was surveyed in 1883, is 5 miles within, and bears W.S.W. from the entrance of Diego Suarez bay; it is 6 cables wide in its own entrance, and extends in a S.W. by S. direction nearly 3 miles to the turn into Cul-de-Sac Gallois, with an average width of $6\frac{1}{2}$ cables.

Port Nièvre was a French settlement prior to the annexation of the whole island of Madagascar. The government, as well as private establishments and buildings, are all at Antsirana, which is the capital of the province of Diego Suarez, which had a population in 1906 of 22,720, of whom 1,868, exclusive of military, were Europeans, and 2,401 Asiatics or Africans. There is a large hospital on Tenre Hanga (Pointe du Corail), and the Residency, which is a very conspicuous mark in entering the harbour, lies about midway between that point and the north-west point of Antsirana. The native part of the town stands on low ground, and is mainly built in the usual style, bamboo, palm thatch, &c. The government buildings and new establishments are more substantial and stand on higher

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1064, Port Nièvre, &c. Var. 6° W.

ground. The population in 1910 was 12,873, of whom a large number were the garrison. The French naval base was moved here from Réunion in 1900.

Diego point, the northern side of the entrance to the harbour, is clifly, 220 feet high, and is the eastern extreme of Andrakaka peninsula; here there is also a hospital, a native village, and a Sakalava camp.

From the inner part of Port Nièvre westward and south-westward as far as the foot of Mount Amber, extends the plain of Anamakia, through which runs the River Maques, bordered by mangrove bushes. The plain is low and marshy in many places, but very fertile, and largely devoted to the growth of rice. That plain, together with the Bétaisa valley and the inner part of Friend's creek at Port Nièvre, constitute nearly the whole of the low ground in connection with the Settlement; in other parts the land, rising abruptly, or by slopes more or less steep, to heights varying from 50 to 260 feet.

Depths.—The depth for the greater part of the width varies from $4\frac{1}{2}$ to 8 or 9 fathoms, but a coral head of $3\frac{3}{4}$ fathoms lies S. 16° W. distant $3\frac{1}{2}$ cables from Diego point, and consequently nearly in mid-channel of the entrance.

Commercial and Military harbour.—The Commercial harbour is bounded to the north-east by a line joining Tenre Hanga (Pointe du Corail) and the eastern end of Diego point; to the south-west by a line passing 82 yards northward of the north-east corner of the naval coal store, and thence, on the bearing N. 55° W., as far as the opposite shore. The Military harbour is bounded to the north-east by the Commercial harbour; to the south-west by a line starting from the right bank of the mouth of Caiman river, and running N. 47° W. The portion of the Military harbour constituting the Arsenal, properly speaking, that is to say, Friend's creek and the neighbouring zone, may be closed at times, with booms, so as to prevent the access of vessels and landing of goods. The Military harbour is under the authority of the Naval Commandant; it remains accessible for merchant vessels under the condition that they conform to the regulations of the naval authorities. The part of Port Nièvre not included in the foregoing limits, and the Cul-de-Sac Gallois are connected with the Commercial harbour. The part of the bay which extends from the boundary of the Commercial harbour to Oronjia pass forms Diego Suarez Roads.

Shoal.—At half a mile N.W. by W. $\frac{1}{2}$ W. from the lighthouse is a shoal with a depth of $3\frac{3}{4}$ fathoms.

Harbour lights (*Lat. $12^\circ 16'$ S., Long. $49^\circ 18'$ E.*).—From the end of Antsirana jetty, at the S.E. entrance of the harbour, at an elevation of 29 feet above high water, is exhibited a *fixed* light, showing *white*, *red*, and *green* sectors; it is visible in clear weather from a distance of 6 miles. For sectors, *see* Light list and charts.

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1064, Port Nièvre, &c. Var. 6° W.

A *fixed red* light is occasionally exhibited at the landing jetty, on the north-west side of the town.

The two entrances to the basin are each marked by a *red* light on the port hand, when entering from seaward, and by a *green* light on the starboard hand.

Buoys.—The Messageries Maritimes have a red mooring buoy about 2 cables W.N.W. from Antsirana jetty and a black one off the coal stores, Cape Cherbury. The Company Chargeurs Réunis have three mooring buoys, one red, and two black, all lying off the landing jetty.

Anchorage (*Lat. 12° 16' S., Long. 49° 17' E.*).—The anchorage is excellent in from 4 to 10 fathoms, good holding ground. Large vessels should anchor westward of the mooring buoys. There is also good anchorage in from 7 to 13 fathoms in the Cul-de-Sac Gallois at the head of the harbour off the entrance of Maques river, but the approach to it is shoal; a short distance up the river is a French trading station.

Basin.—A basin about 400 yards long, and 200 yards wide, has been constructed on the south-west side of Antsirana. There are two entrances, both lighted, as mentioned above.

The depth of water in the basin is not known.

A dry dock is being constructed, *see* Appendix IV.

Signal station.—There is a signal mast and a look-out man south-westward of the Observation pillar. The national ensign is hoisted at the gaff when a vessel is sighted, and when the vessel is the mail steamer the Messageries Maritimes house flag is hoisted at the yardarm.

Storm signals are made from the flagstaff near the town jetty: by day, a *red* flag; by night, a *red* light.

Communication.—The Messageries Maritime Company's steamers arrive from France the 3rd or 4th and 13th or 14th of each month; steamers returning call on the 5th or 6th and 21st or 22nd. A branch steamer of the same company runs from Port Nièvre to Durban, calling at the principal east coast ports and Tulléar. The steamers are timed to arrive and leave Tamatave and Port Nièvre to fit in with the European steamers.

The Havre S.S. Company call monthly on their way out, about the 22nd of the month.

Port Nièvre is the head of the steamer service between Madagascar, the Comoro islands, and Zanzibar. Steamers leave Port Nièvre the 14th or 15th of each month, calling at Nosi Bé, Analalava, Majunga, Mayotta, Mutsamudu, Mohilla, and Moroni, arriving at Zanzibar the 23rd or 24th. They call at the same places on the return journey, and arrive at Port Nièvre the 3rd or 4th.

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1064, Port Nièvre, &c. Var. 6° W.

A small Portuguese steamer sometimes runs from Lorenzo Marques.

There is a monthly steam service between Port Nièvre and Tulléar, calling at all ports on the east coast.

Port Nièvre is in telegraphic communication with Antananarivo, and so with Europe, through Majunga, and with Réunion and Mauritius through Tamatave.

A steam tram runs between Antsirana and Sakarami, a distance of 14 miles, and from Sakarami carriages run to Camp d'Ambre, on the side of Mount Amber.

Trade.—In 1910 the value of imports was £192,796, exports £155,645. The vessels which entered in 1910 numbered 122, of a total tonnage of 201,222 tons; this represents 13½ per cent. of the total shipping of Madagascar.

Coal.—The following stocks of coal are usually kept; French Government 8,000 to 10,000 tons of patent fuel; Messageries Maritimes Company, 4,000 to 6,000 tons of Welsh coal (not for sale); Simonette & Lippacher, 1,200 tons of patent fuel and Welsh coal; and Barriquand & Co., 200 tons of patent fuel.

Supplies.—Fresh meat and bread are plentiful, and vegetables from June to November.

Water.—Good water is supplied free of charge by the Government; the water tank is towed alongside vessels.

Tides.—It is high water, full and change, at Port Nièvre at 4h. 17m.; springs rise 6½ to 8½ feet, neaps 4¾ to 5¾ feet.

Cul-de-Sac Gallois (Welshpool) (*Lat. 12° 17' S., Long. 49° 14' E.*) is a large shallow basin westward of Port Nièvre, with depths of one to 3 fathoms. There is limited anchorage, however, off the entrance to Maques river, as before mentioned.

Plan 1116, Diego Suarez bay.

Andovobatofootsi (English bay) (*Baie des Cailloux blancs*) is 2 miles wide at the entrance, and nearly 6 miles deep; the entrance is between Cape Vatomainti on the north and Andrahompotsi point on the south. Tsiala bay is the name given to the large bay in the north-western corner, besides which there are several smaller coves round the bay. On the western side of the bay is a remarkable range of mountains, of which Ankaramisampana, before described, is the highest; northward of this peak is Bobaombyvatobe, 787 feet high, and southward a peak 722 feet high, and at the foot of this range, near the head of Andohazampo cove, is a remarkable hill like a trapeze, 164 feet high.

There are three islands in the bay; the most remarkable is Nosi Loatrafasana, or Sepulchre island, which lies W.N.W. a distance of about 2 miles from Andrahampotsi point; it is less than 200 yards in diameter, 328 feet high, and perforated with caverns used by the

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1116, Diego Suarez bay. Var. 6° W.

natives as burial places (hence the name), and in which, it is said, human remains are preserved for many years. Nosi Koba, or Bathurst island, is on the north side of the bay; it is 49 feet high, covered with trees, and lies about half a mile from the coast; its northern end has a coral spit covered with sand running out for a distance of about one cable, and which dries at low water; the southern end is nearly steep-to. Nosi Fanu, or L'îlot de la Tortue, is on the south-western side of Tsiala bay; it is 23 feet high, and lies half a mile from the coast, to which it is joined by a shallow bank on which there is a coral patch awash at high water springs; a remarkable boulder lies on the side of the hills about one mile westward of Nosi Fanu.

Shoals.—The only dangerous shoal in the bay is two rocky heads of $2\frac{1}{2}$ and $2\frac{1}{4}$ fathoms, with from 6 to 10 fathoms close-to all round, which lie northward of Nosi Loatrafasana at a distance of 9 cables. A small coral head, but having $5\frac{1}{4}$ fathoms over it at low water, lies N.E. by N. a distance of 7 cables from Andrahampotsi point.

Anchorage.—The best anchorages are in Farafakabe cove, in from 5 to 10 fathoms, mud; in the cove north-eastward of Nosi Koba, and in Bivouac cove, but good anchorage may be found in any of the coves.

Andovokaratra (Irish bay) (Baie du Tonnerre) (*Lat. $12^{\circ} 12' S.$, Long. $49^{\circ} 20' E.$*) is on the north side of the entrance to Diego Suarez bay, and lies between Cape Vatomainti (George head or Cap des Rochers noir) and Cape Tanifotsi; it is the only bay in which the anchorage is not good, the depth being great except near the head, and the whole bay is very much exposed to the S.E. monsoon. The eastern shore of the bay is cliffy, with deep water close-to; the western shore is fringed by a coral reef which dries out for a distance of about 7 cables.

The plains in all the bays, which during the rainy season are covered with rich grass, furnish abundance of pasturage for cattle. At the end of the dry season, the herbage, having become useless, is burnt, and shortly after a new crop appears, green and tender, which cattle eat with avidity. There are no large forests around the bays, but ravines in the hills, some of the summits, and the river sides are nearly always well wooded.

The bays abound with fish. Numerous edible turtle are also to be caught, as well as the hawks-bill turtle, which furnishes shell. Oysters are found in abundance on the rocks.

Directions.—Vessels approaching from the eastward should make the land in about lat. $12^{\circ} 30' S.$, or 20 miles to windward of the entrance; on nearing which, Ankaramisampana should be seen open of Cape Andranomodi, and that line should be preserved until close

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1116, Diego Suarez bay. Var. 6° W.

in, when Nosi Langor will be seen and recognised, care being taken not to mistake the rock off Cape Andranomodi for it, and also to avoid Le Grand banc and other dangers mentioned on page 240. Ambohitivi peak in line with the summit of Suarez island, bearing N. 39° W., leads eastward of these dangers.

The best leading mark through the Oronjia pass (*Lat. 12° 14' S., Long. 49° 23' E.*) is then, Nosi Langor appearing between Ankaramisampana and Andramaimbo, bearing N. 78° W.; that line leads nearly midway between Cape Andranomodi and the reef extending southward from Nosi Volana, and the former should be kept aboard rather than the latter; but in bad weather it is best to keep Nosi Langor on with Andramaimbo as the leading mark.

When inside, a vessel will be in smooth water, but care must be taken to guard against squalls from the southern bay, which, during the strength of the monsoon, are frequently experienced. Keep on the same leading line until within about a mile of Nosi Langor, and when Port Nièvre lighthouse bears S. 54° W. steer for it, passing between the Oronjia bank and the coral patch southward of Nosi Langor; after which the chart is the best guide to the anchorage.

Vessels from the northward should keep a good offing to avoid Diego and Suarez islands and the shoals about them, until the leading marks are recognised.

By night, keep in the *white* sector of Nosi Langor light between the bearings of N. 78° W. and N. 81° W., having first approached and opened the entrance by bearings of the *flashing white* light exhibited on its southern side, until you arrive in the *white* sector of Port Nièvre light (passing through its *red* sector), when steer for the entrance of Port Nièvre (passing through its *green* sector), and enter the harbour in the *white* sector of Nosi Langor light. If coming from the northward, keep Cape Amber light in sight until the light in the entrance is seen.

During the S.E. monsoon and with an ebb tide, the sea is often very high in the passage; it greatly strains the machinery of a short steamer, and such vessels would do well to arrange for leaving during the flood tide. The exit from the bay under sail is not always so easy as the entrance during this season, as with the conditions described it is dangerous for a large vessel to work out, and she may be detained many days waiting for a favourable slant of wind. At the other season, the land wind blows every night, and there is no difficulty in leaving the port.

Making the land near Diego Suarez requires great care, especially with a sailing vessel during the S.E. monsoon, on account of the current, which, at a moderate distance from the shore, sets towards and

General charts 758, 2762, 2899, 597, 748a, b.

Plan 1116, Diego Suarez bay. Var. 6° W.

round Cape Amber at a rate of 3 knots during the strength and at the end of the monsoon. Sailing vessels arriving in the vicinity during the night, when the wind frequently falls light, should keep a good offing, say 30 miles, until daylight, and take every precaution against the strong N.N.W. current, or they may be drifted to leeward of the entrance and take days to recover their position.

Chart 758, Cape St. Andrew to Antongil bay.

Coast.—Between Nosi Angongo and Ambodi Vahibé bay, a distance of about 7 miles, the coast is broken up by numerous small islands and fringed by a coral reef, near the edge of which most of the islands lie. The only indentation of any importance is the small Baie d'Ampio, which is about 2 miles northward of Ambodi Vahibé. The off-lying dangers are described on page 240.

Charts 1002 and 758.

Ambodi Vahibé bay (*Lat. 12° 22' S., Long. 49° 21' E.*).—This narrow and deep bay is 9 miles southward of the Oranjia pass, between Diego Suarez and Ambavarane; it is scarcely safe for a large vessel, but is much frequented by coasting vessels, which run up on the beach at the head of the bay where there is a village; such vessels prefer this place to Diego Suarez on account of the facility of egress.

Anchorage.—A good berth does not exist, and one suitable for a short stay is difficult to find, as there is a depth of 26 fathoms within a cable of the reef. Vessels wishing to anchor should send a boat in advance to buoy a suitable position.

Directions.—If from Diego Suarez, bring Ambohitivi peak in line with the summit of Suarez island, bearing N. 39° W., when steer S. 39° E. until the small pointed hill called Mount Antsahapano, 673 feet high, and only 3 miles from the head of Ambodi Vahibé bay, is seen between Square mountain and Mount Raynaud, bearing S. 30° W., which leads up the bay.

A vessel from the southward should pass about 4 miles outside Ambodi Vahibé point, so as to avoid the shoal mentioned on next page, and a good offing should be preserved until Mount Antsahapano bears S.S.W. $\frac{1}{2}$ W.

For tidal stream, *see* page 249.

Antala bank, with 10 feet water over it, lies half a mile off-shore eastward of Ambodi Vahibé bay. Dundas island in line with the southern fall of Ambongoabo peaks bearing N. 74° W. leads northward of it.

Shoal.—A shoal, with a depth of about 6 feet over it, is situated about $2\frac{8}{10}$ miles N. 70° E. from Ambodi Vahibé point.

General charts 2762, 2899, 597, 748a, b.

Plan of Port Ambavarane on 1054. Var. 6° 10' W.

PORT AMBAVARANE, Lady Frances, or Rigny bay (*Lat. 12° 27' S., Long. 49° 35' E.*).—**Depths.**—At about 17 miles south-eastward of Diego Suarez is this large basin, mainly occupied by reefs, and intersected by a central channel $2\frac{1}{2}$ cables wide, with depths of from 17 to 8 or 9 fathoms, sand, gravel, and mud; the channel ends $3\frac{1}{4}$ miles within the entrance in French bay, a large shallow lagoon; and there are two bays on its southern side, just within the entrance, both of which are very shallow and dry in large patches at low water.

The entrance is from the eastward, and may be known by the large white sandhill 2 miles to the southward, and by Nosi Ampadraftira or Baleine rock, on which the sea almost always breaks heavily. The entrance is between Samson point, projecting from the mainland on the South, and Cuvillier island or Nosi Antendro on the North. Cuvillier island is of moderate height, and has a very shallow passage on its western side.

Square mountain and Mount Raynaud, previously described, serve to mark the position of Port Ambavarane. At 5 cables south-eastward from the entrance and just within the edge of the shore reef, is Passage islet, of coral, nearly round, and 6 or 7 feet high.

Shoal.—About a mile eastward of Baleine rock is a shoal on which the *Niérre* touched in 1883. The lead gave 2 fathoms, then 5 and 7 fathoms in succession, hard bottom. From the shoal, Mount Raynaud bore W.S.W., and Ambodi Vahibé point N.W. $\frac{1}{4}$ N. The position is, however, considered doubtful, and is so shown on the plan.

Directions.—The leading mark for the entrance is, the South side of Oyster island in line with Square mountain, W. $\frac{1}{2}$ N. (*see view on plan*); but it is best to borrow rather on the northern side of the channel, Cuvillier island being safe at a short distance. When within the points, with Pennelé islet bearing S. W. $\frac{1}{2}$ S., steer towards Mancel point, which may be rounded at half a cable, and there is anchorage just above it, in mid-channel, in from 6 to 8 fathoms, mud.

Water may be obtained from wells near the beach, but it is difficult work. In the south-western part of French bay there is a small river, and half a mile within its entrance the water is said to be sweet and wholesome.

Tides.—It is high water, full and change, at Ambavarane at 4h. 15m.; springs rise 5ft. 10in.

Tidal stream.—Between Port Ambavarane and Diego Suarez bay the tidal stream sets as follows, at springs: At low water, off Port Ambavarane, to the northward along the coast; abreast Ambodi

General charts 758, 2762, 2899, 597, 748a, b.

Plan of Port Ambavarane on 1054. Var. 6° 10' W.

Vahibé bay, to the westward into the bay, at the rate of $1\frac{4}{10}$ knots; one hour after low water, towards the coast and into Ambodi Vahibé bay, at the rate of $1\frac{1}{2}$ knots; half flood, along the coast towards the entrance to Diego Suarez bay, with slack water in entrance to Ambodi Vahibé bay. At high water the stream is very weak all along the coast, but sets out of Ambodi Vahibé at the rate of about half a knot; one hour after high water, sets to the southward, along the coast and out of Ambodi Vahibé, at the rate of four-tenths of a knot; half ebb, the streams are very weak, there is slack water in the entrance to Ambodi Vahibé, and between that bay and Port Ambavarane it sets to the north-eastward at a rate of three-tenths of a knot.

Current.—During the greater part of the year, as previously remarked, the current in front of the port runs north-westward with great strength, but during the N.E. monsoon, a current of about half a knot has been found running S.S.E. at times.

Between Ambavarane and Port Looké the coast is but little known, and Mahalevona bay, northward of which runs the stream Rodo, has not been examined.

Plan 679, Looké, Leven, and Andrava bays.

PORT LOOKÉ (*Lat. 12° 44' S., Long. 49° 47' E.*).—**Depths.**—The entrance to this port is 20 miles S.S.E. from Ambavarane. Bathurst point, forming the eastern side of the entrance, is bordered by a vast coral bank, and a similar reef projects from the western shore, leaving a crooked channel about 3 cables wide, with very irregular depths of from 6 or 7 to 20 or 40 fathoms; at 2 miles off the entrance there is no bottom with 150 fathoms. About 3 miles northward of the entrance is Nosi Komba, 3 miles long, and connected with the shore by a reef, which continues without a break from the outside of the island to the entrance of the port.

Directions.—When about one mile East from the South point of Nosi Komba, the course is about S. by W. $\frac{3}{4}$ W. 3 miles to the entrance between the reefs; when, by conning the vessel from the masthead, she may be steered between the reefs into a port well protected from all winds, and anchored in from 5 to 8 fathoms, sand.

Beyond the usual anchorage, there is an inner broad expanse of shallow water, having at first a depth of from 4 to 6 fathoms; here vessels are protected from the northerly swell. This space is separated from the outer anchorage by a sandbank on the eastern side projecting more than half-way across the channel, leaving a passage only about 3 cables wide, in which the depth varies from 7 to 30 fathoms.

Access to these anchorages appears practicable only after a boat examination of the channel.

General charts 758, 2899, 597, 748a, b.

Plan 679, Looké, Leven, and Andrava bays. Var. 6° 10' W.

Tides.—It is high water, full and change, at Bathurst point at 3h. 30m.; springs rise $7\frac{1}{2}$ feet.

Water.—The River Lokia, which boats have ascended 2 or 3 miles and there found the water fresh and good, flows into the south-western side of the head of the harbour, nearly 8 miles from its entrance; and opposite the sandy spit which separates the two anchorages there is a rivulet where a small supply will be found.

False Port or Toki bay.—On the eastern side of Bathurst point is this large bay, quite open to the northward.

PORT LEVEN (*Lat. 12° 47' S., Long. 49° 51' E.*).—This anchorage is formed between reefs lying off, and others projecting from the coast; the first named surround five islands and many rocky islets, known as Leven islands, extending some 8 or 9 miles northward from Mahrevo or Liverpool point (Point Antsirakangatra).

The islands are all low, covered with brushwood; and bounded by a beach of white sand; only the two largest are partially wooded; these are, Nosi Hau or How island, on the north-western side of the off-lying reef, and Nosi Manambato, $2\frac{1}{2}$ miles farther north-westward and surrounded by the shore reef. Nosi Manambato (Manamboai) is dark and easily seen, but the others, even at a short distance, do not stand out clearly from the land behind them.

Coming from the northward they show up gradually, and, with an uncertain light, it is quite possible that a bearing supposed to be that of the eastern extreme of land is by no means so.

Thumb mountain, S.W. by W. distant 16 miles from the North entrance, and described at page 239, Mount Raynaud, and Square mountain on the one side, with the cone at the River Manambato on the other, afford useful angles and bearings for fixing position.

Anchorage.—Depths.—The distance through the channel from North to South is about 9 miles, and the width affording anchorage varies from 8 cables to $1\frac{1}{4}$ miles in the northern half, and from 5 to 8 cables in the southern half, with some dangerous central patches, especially in the southern entrance, but with large spaces of clear anchorage ground, having from 5 to 9 fathoms, and generally of 6 or 7 fathoms.

In the northern half, the two best anchorages are known as the Outer anchorage in from 6 to 8 fathoms, and the Inner anchorage in from 6 to 10 fathoms. Between them is one of the central dangers mentioned, a small 3-foot coral rock covered with sand; from it, the North point of Nosi Hau bears N.E. by E. $\frac{1}{4}$ E. distant $1\frac{1}{4}$ miles. In the southern half, vessels may anchor anywhere in the channel when

General charts 758, 2899, 597, 748a, b.

Plan 679, Looké, Leven, and Andrava bays. Var. 6° 10' W.

clear of the shoal spots in the entrance. The bottom is generally sand, but occasionally coral.

The **North entrance** between the reefs is about a mile wide, but a small detached $2\frac{1}{2}$ -fathoms shoal off Nosi Manambato reduces it to 7 cables. After passing this patch, the width increases as described until the southern end of Nosi Hau bears E. by S. when it begins to contract towards the southern entrance.

Approaching from the eastward, guard against the usual strong northerly current. In taking the North entrance, a vessel should skirt the outer side of the reefs, from opposite Barracouta island, passing a mile eastward and 5 cables northward of Northern islet, and continuing westward a mile farther before hauling in for the entrance, a sharp lookout being meanwhile kept from the masthead. Having arrived nearly opposite the northern end of Nosi Hau, a sandy spit of great extent at low water, come to in the Outer anchorage.

Or, if proceeding to the Inner anchorage, stand on to the southward, keeping well clear of the north-western side of Nosi Hau until the whole of Shatta island is open of Sand point, the south-western angle of Nosi Hau; then steer about S. by E. for about 5 cables to avoid the 3-feet central shoal; after it has been passed, the course will be about S. by W. to the Inner anchorage, where 8 or 10 fathoms will be found, with the North point of Mora island in line with Artémise point; the latter is a hummock about 66 feet high, showing above the palm and other trees with which the plain is covered, and visible from all parts of the bay.

Tree hill is another high spot 4 miles southward of Artémise point and equally close to the beach.

On the western side of the North entrance, and southward of Nosi Manambato, is a bay with from $3\frac{1}{2}$ to 5 fathoms, affording good shelter, but its entrance is barred by a reef, leaving only a narrow passage at either end, either of which should be buoyed before being used.

South entrance (*Lat. 12° 53' S., Long. 49° 55' E.*).—Although this passage has, for a sailing vessel, the advantage of a fair wind, it is more difficult than the North entrance, the necessary changes of course being numerous, the dangers hidden, and the landmarks not easily recognised except by persons with thorough local knowledge. The following remarks may, however, be useful for a steam vessel entering with smooth water, a good lookout at the masthead, and with the sun astern.

Having made the land and approached to within half a mile of Liverpool point, she should steer N. 45° W., having the right extreme of the high hills slightly open north-eastward of Southern islet, a

General charts 758, 2899, 597, 748a, b.

Plan 679, Looké, Leven, and Andrava bays. Var. 6° 10' W.

mere rock on the edge of the shore reef having a black appearance and lying westward of Manampaha, the southernmost of the Leven islands, on which is a single hummock. When the eastern extreme of Manampaha bears N. by E. $\frac{1}{2}$ E. haul up to N. 24° W., steering direct for Middle islet in line with the rocks forming the eastern extreme of Nosi Manambato, and taking care to keep clear of the reef extending southward from Manampaha island until it has been passed. This line leads through in mid-channel, but the current is strong.

When Southern islet bears S.W. by W. about 3 cables, the course to be made good for about 2 miles is N. 49° W., guarding against any current possibly setting towards the shoals off Shatta islet. When the isolated rock North of Shatta is in line with the summit of Rata island, and Tree hill is open to the right of Bird rock, steer about N. 15° W. towards the rock close off the eastern side of Nosi Manambato through to the Inner anchorage, before described, near Mora island.

Landing.—During the day, the sea becomes short and high, greatly interfering with boating. The beach is nearly everywhere flat and bad for landing, especially at low water, when a ship's boat grounds a long distance from the shore.

Water.—The only water to be found in this vicinity is a stagnant muddy pond on the north-western side of the hill on Artémise point.

Tides.—It is high water, full and change, at Port Leven at 3h. 30m.; springs rise $7\frac{1}{2}$ feet. The general set of the flood stream when clear of the islands is northward.

Local current.—The general northerly current prevailing during the S.E. monsoon is deflected by the Leven islands towards the North and North-east, leaving between it and the coast a space then occupied by an eddy or counter current of considerable strength, flowing southward or south-westward. This counter current might endanger vessels bound southward during the night, and its limits eastward being uncertain, caution must be observed when approaching and passing Barracouta island.

Andrava bay (*Lat. $12^{\circ} 55'$ S., Long. $49^{\circ} 54'$ E.*).—The position of this bay may be known by Thumb mountain bearing W. $\frac{1}{2}$ N., and by the trend of the land. Berry head, the southern point of the bay, is the northern termination of ground of a reddish colour, level, and of moderate height. Liverpool point, the northern point, bears N. by W. $\frac{3}{4}$ W. distant 2 miles from Berry head, and is the southern extreme of a chain of round-topped hummocks.

Depth, &c.—The bay is 2 miles wide, and almost semicircular: within it, and near the centre, is an island 3 cables long N. by E. and

General charts 758, 2899, 597, 748a, b.

Plan 679, Looké, Leven, and Andrava bays. Var. 6° 10' W.

S. by W., round which are depths of 4, 6, and 9 fathoms, except where reefs run off about one cable at the northern and 2 cables at the southern end. The bay is open to the North and North-east; but, in the south-eastern side, there is protection from easterly winds, in about 4 fathoms, with Berry head bearing N.E. by E. distant 5 cables.

The small river Andravina flows into the southern part of Andrava bay.

Chart 758, Cape St. Andrew to Antongil bay.

COAST.—Between Andrava and Vohemar bays, the coast is but little known, and does not possess any sheltered anchorage. From Berry head to Manambato river the coast at first is a long sand-beach, with small whitish cliffs, and a scanty but uniform vegetation of bush. About 7 miles southward of Andrava bay is Pointe aux Iles or Tanjona point, with several unexamined islets and the little River Ifontsi; a few miles farther southward are the Three Brothers islets, of which the southernmost is in line with Thumb mountain when it bears N.W. by W. These islets are all so close in-shore that none of them can be distinguished from a distance.

Manambato point (*Lat. 15° 14' S., Long. 49° 57' E.*), 8 miles southward of the Three Brothers, is a massive triangular rock, very easily recognised, but scarcely assuming a triangular form unless seen from the southward or eastward. From the northward, the position may be known by a small conical hill in the bight near the mouth of the River Manambato, which hill is marked when southward of Manambato point.

The River Manambato is about a mile northward of the point, and the bight into which it discharges is 3 miles wide and recedes about one mile from the coastline. The bar of the river commences a quarter of a mile westward of the point and runs from shore to shore the whole width of the bay; even for boats it is impassable in ordinary weather. The point is steep-to, but a passing vessel might easily mistake the outer line of discoloured river water for the edge of a shoal.

A short distance southward of Manambato point, where the coastline recedes, is an islet on a reef extending from the shore. A reef bordering the shore commences just southward of the islet; at first it extends only a short distance out, but 2 miles farther South it widens considerably; here the coast ceases to be rocky and becomes marshy and bordered by mangroves as far as Vohemar.

About one mile S.S.E. from Manambato point, near the islet mentioned, is an inlet in the reef affording refuge for coasting vessels or small schooners. A village formerly stood opposite the opening, but it was abandoned in 1885. A rivulet of good water flowed close to it.

General charts 2899, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 6° 20' W.

This is the only accessible landing place between Manambato point and Vohemar.

Green or Verte island.—One mile southward of the inlet, the reef increases to 8 cables in width, and then extends by a curve slightly convex towards the sea, until it reaches Green island. This island is upwards of 100 feet high, of a dark colour, and stands on the edge of the coast reef, about $3\frac{1}{2}$ miles northward of Vohemar point; it may be known by a grey sheet-iron building on it which makes a good landmark.

Plan of Vohemar bay on 679.

VOHEMAR BAY (Vohimao) (*Lat. 13° 24' S., Long. 50° 2' E.*) offers good shelter, though the space is very contracted; it is a deep recess in the coastline, enclosed between the low well-wooded Vohemar point or Point Harambazaha to the south-east, and a large coral reef to the westward and north-westward, extending $2\frac{1}{2}$ miles from the shore and leaving a large space within, but principally of shallow water. On that reef, which nearly covers at springs, the sea breaks at all times; and at the south-eastern part it breaks, in 3 fathoms, more than a cable outside the reef.

Depths, &c.—The width of the entrance is one cable between the reefs off the point, and the depth varies greatly between 20 and 5 fathoms. It is only difficult to distinguish the entrance during very strong south-easterly winds, when the sea breaks right across.

In 1903 the s.s. *Romford* reported striking something, presumably a rock, when entering the harbour, but no particulars as to its position were given, and nothing further has been heard of it.

The Black rocks on the edge of the northern reef are about 30 feet high, and Nosi Bé or Black islet about 100 feet. Green islet, just now described, is on the outer part of the same reef.

Approaching from the North-east, when within 5 or 6 miles of Black islet, Vohemar point, thickly covered with trees about 70 feet high, will be seen between two high table lands, of which the southern is the smallest. In front of the high lands are other hills, either of table or saddle form, from $1\frac{1}{2}$ to 2 miles from the point. No part of the town nor of the Malagasy cemetery is visible from the sea; and the whole western side of the bay up to the entrance of the River Mantialac is bordered by dense mangrove bush.

Vohemar is the capital of the province of that name. At the last census the population of the province was 43,913, of whom 212 were Europeans or assimilated, and 159 Asiatics or Africans.

The town stands on the inner side of the point, and has a mixed population numbering, in the whole, 1,294. The place is considered to

General charts 2899, 597, 748a, b.

Plan of Vohemar bay on 769. Var. 6° 20' W.

be fairly healthy; the climatic diseases are malarial fever and dysentery.

Beacons, &c.—A signal mast, the top of which is 100 feet above the sea level, stands near the shore in front of the Residency at Vohemar point. On the hill or plateau, about 2 miles S.W. by W. from the point, is a semaphore, and near it is No. 1 beacon, of masonry, 26 feet high, 20 feet wide, painted white with a black vertical stripe, and standing about 370 feet above the sea. When in line with the signal mast it bears S.W. by W. $\frac{1}{2}$ W.*

No. 2 beacon stands on the southern point of the north reef; it is a pyramid 6 feet square in the base, 16 $\frac{1}{2}$ feet high, and is painted in black and white horizontal bands.

No. 3 beacon stands on high ground on the western side of the bay near the summit shown as 184 feet in height; it is of pyramidal form, 20 feet high with a square base, and is painted white with three horizontal black bands, equally spaced, and each 3 feet wide; it bears W. $\frac{1}{2}$ S. from No. 2 beacon.

Buoy.—A red conical buoy, surmounted by a conical topmark, is moored in a depth of 11 fathoms on the northern side, inside the entrance to this bay.

Directions.—When entering this bay either from the northward or southward, steer parallel with the coast until the signal mast at the Residency is on with No. 1 beacon S.W. by W. $\frac{1}{2}$ W.; run in on this line until Nos. 2 and 3 beacons are in line bearing W. $\frac{1}{2}$ S., when follow that lead. Round the reef off Vohemar point at a moderate distance, favouring the side of the channel, the reef being steep-to, and slacken speed in good time to avoid running past the anchorage. The best time for entering is at low water, when more of the dangers are visible; and the great northern reefs being uncovered, there is no run of tidal stream across them.

Sailing vessels entering with a south-easterly wind must be prepared to find the wind heading them before reaching the anchorage, especially if entering before 10 a.m.

The anchorage (*Lat. 13° 24' S., Long. 50° 2' E.*) is rather towards the southern shore in about 11 fathoms, with the Residency signal mast bearing S. by E. $\frac{1}{2}$ E. scarcely more than a cable distant; long vessels should moor. Small vessels go farther up, where the holding ground is good but the space very small, the whole of the inner part of the bay being extremely shallow; such vessels sometimes lie alongside a sandy beach westward of Vohemar point, and make fast to the cocoanut trees.

Tides.—**Tidal streams.**—It is high water, full and change, at

* A surveying mark, white triangular with flagstaff, is erected westward of this beacon, with which it must not be confused.

Plan of Vohemar bay on 679. Var. 6° 20' W.

3h. 20m.; springs rise $5\frac{1}{2}$ feet. The stream takes the direction of the channel, and its rate is $1\frac{1}{2}$ knots at springs. Inside, the flood stream becomes deflected to the northward. The ebb stream outside turns to about N.N.E.

River Mantialac (*Lat. 13° 22' S., Long. 50° 0' E.*).—**Water.**—A channel, practicable for boats and small craft, exists from the anchorage to the mouth of this river, $2\frac{1}{2}$ miles to the northward; but there is no passage to sea, even for boats, in that direction. The river entrance is divided into two branches by an island; the northern branch is passable by small boats at all times, and it is only at low water that large boats are stopped at the bar. The southern branch is only practicable by boats at half-flood. Within, there is a good deep channel.

It is not necessary to ascend beyond the first bend or elbow of the river in order to find good fresh water.

At $1\frac{1}{2}$ miles westward of the north-western angle of Vohemar point, is a rivulet of little importance, but of sufficient volume to overcome the flood tide. The water is very good, but there is difficulty in obtaining a large supply, as it discharges into a marsh and across a large border of mangrove.

Trade.—The principal export trade is in cattle, of which great numbers are brought in from the surrounding country; hides, rubber, gum, copal, and small quantities of ebony and rosewood are also exported. The principal imports are cotton goods. In 1910 the imports amounted to £5,909, and the exports £33,097.

The number of vessels that entered the port in 1910 was 58, of a total tonnage of 35,123 tons.

Supplies, &c.—Rice, cattle, poultry, pigs, and potatoes may be obtained, but there are no facilities for repairs.

Communication.—The Messageries Maritimes East Coast branch steamers call regularly every two months on their way between Tamatave and Diego Suarez, both coming and going. Sailing vessels of about 40 or 60 tons visit the port during the months of October to March or April. There is telegraphic communication with Antananarivo, and there are two roads fit for palanquin traffic.

Chart 758, Cape St. Andrew to Antongil bay.

COAST.—From Vohemar to Sambava the coast, with some slight indentations, trends almost due South, and as far as the River Matainga, retains the general aspect which it had farther north; it is generally safe of approach, there being deep water near the shore and no outlying dangers or extending reefs, except for a short distance off the more prominent points, where the sea breaks continuously. Of these points, Cap des Gouffres, 11 miles south of Vohemar, is remark-

General charts 758, 2899, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 6° 30' W.

able; it is a high, steep cliff, against which the sea breaks, with detached rocks surrounding it at a short distance.

In the background are high mountains of steep rocky appearance, and nearer are mountain chains gradually diminishing in height the nearer they are to the sea, and generally running parallel with the coast; these mountains and hills are mostly bare and of a reddish aspect. The vast open plains, yellow and dried up during the S.E. monsoon, are green during the rainy season, and have a scanty growth of shrubs and trees in ravines and sheltered places, and of brushwood, where not rocky, near the coast.

These characteristics are in marked contrast to the appearance of Vohemar, and also to the coast southward of the River Matainga, where there is much verdure and an unbroken sandy beach fronting a thickly-wooded country; for here forests commence, growing thickly, covering all the country, and continuing with but slight interruption until past Tamatave. On this long stretch of coast remarkable points are not lacking, but some are only approximately correct as regards longitude.

At 5½ miles from Vohemar is the mouth of the River Manambero; at 2½ miles farther is another small river; at one mile north-westward of the latter is the village Amboaniho. Between the two rivers, a very short distance inland is a conical hill, 350 feet high, very conspicuous though seen against a background of flat-topped hills higher than itself, and from its black, bare, and rocky appearance contrasting strongly with its surroundings of green or yellow, according to season.

Anorontani point is a precipitous bluff of some height, with no rocks or reefs at its base. There is a small bay, Amboanio creek, on the northern side of this cape, with a little sugar-loaf hill in its western part. This bay has been described as affording good anchorage, which must, however, be considered as very doubtful.

From about Anorontani point, the land becomes considerably lower, with a remarkable depression in the coastline, the only one of its kind in these parts; it forms the basin of the River Fanambana. Near it, at one mile inland, is the small and completely isolated hill Mahanara, on the summit of which vestiges of ancient stone buildings are said to exist; when seen from the north-eastward it resembles a sugar-loaf flattened at the top; from the southward, it resembles a wedge; it is difficult of recognition if the weather is at all hazy. The hills bordering the shore southward of Vohemar cease at this hill, but recommence 5 or 6 miles farther South.

Sambriano point, 11 miles southward of Anorontani point, is somewhat marked, and a reef extends from it apparently about 5 cables.

The **Peak of Sambriano** (*Lat. 14° 3' S., Long. 49° 48' E.*) is
General charts 2899, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 6° 40' W.

higher than any of the surrounding hills and often hidden by clouds; when seen from the northward, another hill will be observed with a remarkable notch, at 2 miles south-eastward of its summit.

Sambava village.—Good landmarks by which to discover the locality of this village are the peak of Sambriano; and also another large hill, covered with trees, close to the sea and to the River Sambava. From the base of this latter hill three low wooded points, close together, project into the sea; there is generally a heavy surf on them. The trees are so thick, and the points so nearly parallel, that they look like two long avenues. Northward of these points, in the angle they make with the coast, is the village, hidden in the midst of rich vegetation. The country in the vicinity is said to be salubrious.

Telegraph.—Sambava is in telegraphic communication with Majunga, and with Antananarivo, and consequently with every place of importance in the island and with Europe.

Anchorage may be found in the open roadstead opposite the mouth of the river in 10 fathoms, fine sand, at $1\frac{1}{2}$ miles from the village; it is used by a few trading schooners and other small craft, and the holding ground is fair, but there is absolutely no shelter whatever.

Table hill or **Antalaha** (Mt. Ambanitazana) is very remarkable, massive, and perfectly circular: it may be seen from seaward at a distance of 40 miles, and apparently on the coast, though really 3 or 4 miles inland, but the intervening land is low. From the northward, another hill about a dozen miles farther North, and of less regular shape, may be mistaken for it. In clear weather both hills will be seen at the same time; but in hazy weather the mistake is easily made. From the southward, a bare conical hill will be seen between Table hill and the coast.

The River Mananara-bé falls into the sea just northward of Table hill.

Antálaha or Antala point (*Lat. 14° 50' S., Long. 50° 18' E.*) is the extreme of a low bare plateau with a small village on it. When opposite it, Table hill bears about N.N.W. distant 10 miles. Detached reefs skirt the shore in this vicinity, leaving, it is said, a smooth water passage inside them used only by native boats.

Anchorage, only fit for fine weather and entirely exposed, may be taken up in from $6\frac{1}{2}$ to 10 fathoms near the reef, after having crossed a bank farther out with 7 fathoms over it. Southward of the opening in the reef the bottom is sand; northward of the opening, there are patches of rock. The best berth is in 9 fathoms, with the village

General charts 2899, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 6° 40' W.

bearing West or W. $\frac{1}{2}$ N. There is a little trade here carried on chiefly by Arab boats.

The opening in the reef affords a passage for boats under favourable circumstances; ships' boats should wait outside until a native boat arrives to pilot them in. Two patches of coral, joining the shore, form a little cove, where landing can be effected on dry ground.

Tsiananga point, 5 miles southward of Antálaha, has off it some remarkable detached black rocks, rising to some height above the sea; they extend under water seaward for some distance, and should not be approached within a mile.

Plan of Angontsi road on 680.

Angontsi (Ngonci) road (*Lat. 15° 13' S., Long. 50° 28' E.*) is just northward of Cape East; it is a bay 2 miles wide, with a large opening between reefs forming the shelter to the anchorage. The entrance is 7 cables wide, with from 6 to 8 fathoms; inside, the width is more than a mile, with from 4 to 6 fathoms. The reef enclosing the south-eastern side of the bay extends $1\frac{1}{2}$ miles northward of Nosi Angontsi and Cape East; that on the northern side projects a mile from the shore.

The reefs are plainly to be seen and steep-to, and the roadstead easily entered; the only precaution necessary being to follow closely the line of the reefs so as not to miss the entrance. There are several narrow and very dangerous openings in these reefs, where the sea breaks heavily, and in others there are high overfalls, but none of these can be mistaken for the wide opening into Angontsi bay.

The village Antranombazaha is on the southern side of Angontsi road; Ngabé or Aonibé is on the north-western side on a sandy peninsula, forming the southern side of the entrance to the river of the same name, which is shallow and barred by a reef across the entrance. The villages are $1\frac{1}{2}$ miles apart on low ground, and cannot be seen until close in.

Anchorage.—Vessels may anchor in any part of the road in 6 or 8 fathoms, but during the S.E. monsoon the weather side is decidedly preferable, and as close in as possible in order to avoid the swell, which sets heavily round the reef. Vessels are well protected from all quarters except from winds between North and E.N.E. Landing is not difficult.

Supplies.—Oxen were bought in 1883 for nine or ten dollars each. The whole province of Maroa, in which Angontsi is situated, is celebrated for its large bananas. A moderate quantity of fish may be taken with the seine.

General charts 2899, 597, 748a, b.

Plan of Angontsi road on 680. Var. 7° W.

CAPE EAST, the eastern point of Madagascar, is a low sandy point; the land in the vicinity makes as a succession of hummocks, appearing above the water as it is approached, which may be done boldly, as this coast is free from outlying dangers; but the coast reef extends seaward more than a mile. At $2\frac{1}{2}$ cables eastward of the cape is Nosi Angontsi, flat and covered with vigorous vegetation of a lighter colour than that on the mainland, which circumstance assists to identify the locality, though it cannot be seen until after the hummocks on the shore, and never appears detached from the land until the vessel is entering Angontsi road.

Chart 758, Cape St. Andrew to Antongil bay.

LIGHT (Lat. $15^{\circ} 15' S.$, Long. $50^{\circ} 29' E.$).—A white group flashing light, showing groups of two flashes every twenty seconds, at an elevation of 236 feet above high water, and visible in clear weather from a distance of 21 miles, is exhibited from a metal tower, 60 feet high, on Ambohitsara hill, about $1\frac{1}{2}$ cables from the coast, and at a distance of about one mile southward from the extremity of Cape East.

The current is very strong off Cape East, especially during the S.E. monsoon. Approaching the coast from South or South-east, it inclines to North or North-east near the projecting land, and a counter current, the limit of which is uncertain, is formed opposite the receding coastline to the northward, similar to that northward of the Leven islands; see also page 253. During hazy weather, or at night, a vessel should keep a good offing so as to avoid this counter current.

Coast.—From Cape East to Vinambé, a distance of 43 miles, the coast is very uniform and affords no anchorage, except about midway near Tanjokatafa point, where there is a small port, not as yet surveyed, but said to be a good one, where a wood-cutting company embarks timber in small sailing vessels.

The first part of this coast consists of a series of wooded hills, running parallel with the shore, declining rapidly to the sea and forming occasional cliffs interrupted by long sandy beaches. Behind these is a succession of high hills, covered with trees, undulating, and very uniform in appearance. The fringing reef which borders the coast for a width of from one to 2 miles, is said to be wider than at any other part of the eastern coast of Madagascar, and wider near Cape East than towards Cape Masoala; it is, however, everywhere steep-to and with a good lookout may be coasted along at a very short distance outside the reefs.

General charts 2899, 597, 748a, b.

Plan of Vinambé bay on 680. Var. 7° 30' W.

Vinambé bay or Veninguebé (*Lat. 15° 55' S., Long. 50° 15' E.*) is 3 miles northward of Nepato island; it is a recess in the land partially enclosed by reefs, which leave a passage into the bay 5 cables wide; the shore round the bay is also fringed by reefs.

This bay being open to the S.E. monsoon offers no security during that season, and is not even mentioned by late French writers as an anchorage. The best berth would appear to be opposite an opening in the reefs on the northern side in $6\frac{1}{2}$ or 7 fathoms.

Chart 758, Cape St. Andrew to Antongil bay.

Nepato or Nepatte island, a quarter of a cable south-east of Cape Masoala, is of moderate height and covered with trees; it is easily distinguished when open of the land, and when not open, the vegetation on the island shows darker than that on the mainland. When seen from the northward, its aspect is that of table land; and, from the eastward, of a long hill.

Cape Masoala or **Durnford Noss**.—The land about this cape is low and the hills in the background are without any defined characteristic, therefore it is difficult to recognise the precise point. From Nepato island the fringing reef continues to border the coast for a width of about one mile, and extends to Cape Baldrisi or Antriraka, the southern point of entrance to Antongil bay; the small islet Behente or Bentanana, which lies close southward of the cape, is low, sandy, of light colour, partly covered with trees, and shows out well from the coast. A group of rocky islets surround it, one of which to the southward is very black.

Capt. Denis, in the *Hugon*, rounded this cape in entering Antongil bay, and stated that he passed close to Nepato and Behente islands, following the reef round and navigating by the eye, in fine weather; and the distance the vessel passed from the coast was estimated at not more than one mile. Inside the bay, the fringing reef discontinues.

CAUTION.—The current runs rapidly round the capes, and into Antongil bay during the S.E. monsoon; at that season, vessels are cautioned to give the capes a wide berth, especially when leaving at night.

ANTONGIL BAY.—This large bay, called by the Malagasy Mangabé, and by the Portuguese Antonio Gillo, after the European who first visited it, and from whose name its present designation is derived, is about 45 miles in extent from the entrance to the head, and 23 miles wide between Capes Bellone and Baldrisi. On all sides it is enclosed by high mountains covered by forest. Those on the East are uneven, and are detached branches of a central chain, which come

General charts 2899, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 7° 30' W.

down to the sea in very remarkable long slopes, leaving between them deep valleys. Those on the West are uniform in shape, of equal height, and form a wall running parallel with the coast. On that side are two fine cascades; the first is vertical, the second a torrent; they show the positions of two rivers which flow into the bay northward and southward of the village Amboisa. The land at the head of the bay is low; the two mountain chains forming the sides, continue to run to the northward converging towards each other, and ultimately join, leaving a thickly-wooded plain about a dozen miles wide between them and the shore.

Depths, &c.—The depth in Antongil bay decreases from 40 to 30 fathoms at the entrance, to 20 and 13 fathoms, and less at the head. There are no reefs anywhere, but there is one small shoal, as presently described, and there are rocks close to the shore at many places, and mostly above water; those covered are easily visible from aloft, and a lookout should be kept in respect of them.

Anchorage may be taken up almost anywhere in the bay, especially on the eastern side, but that at Nosi Marosi, about to be described, is by far the best.

Plan of Hastie road and Port Choiseul on 680.

Nosi Marosi or **Mangabé island** (*Lat. 15° 30' S., Long. 49° 52' E.*).—**Anchorage.**—This island is near the head of Antongil bay, the nearest part being $1\frac{1}{2}$ miles from the entrance of the River Antanambalana or Tsingambala. It is $2\frac{1}{2}$ miles in length, densely covered with trees, about 1,000 feet high in its northern part, and 150 feet higher at its southern peak, the highest part of the island; it may be seen from the entrance of the bay in clear weather. With the exception of one small rock, above water, about 2 cables from its southern end, its shores are absolutely free from danger, and vessels may anchor anywhere round it in from 8 to 10 fathoms at 2 or 3 cables off-shore. The best anchorage, however, is in a small bight called Port Memoria, on the western side (*see plan*); here H.M.S. *President*, a 50-gun frigate, moored in 1849 within the line of the two points of the bay in 9 fathoms, with two other vessels anchored still closer in. Wood, water, and a few provisions may be obtained here.

Four islets lie southward of Nosi Marosi within a space of $4\frac{1}{2}$ miles; they are Nosi Ravina, Nosi Harami, Nosi Milomboka or Milikambo, and an unnamed one northward of the latter; all have trees on them, are of moderate height with a rocky aspect, and are not seen so soon as the larger island. None show any trace of habitation.

Hastie road includes the whole of the outer sheltered space westward of Nosi Marosi, the northern or inner part westward of the

General charts 2899, 597, 748a, b.

Plan of Hastie road and Port Choiseul on 680. Var. 7° 30' W.

River Antanambalana being called Port Choiseul; the depth of water over that large space does not exceed 12 fathoms, and the bottom is mud.

Shoal (*Lat. 15° 25' S., Long. 49° 47' E.*).—A small 2½ fathoms bank lies 5½ miles West from the northern end of Nosi Marosi and 8 cables from the western shore of the bay.

Port Choiseul has undergone great changes since Owen's survey. The River Antanambalana now discharges into the bay in a W.N.W. direction northward of Maroantsetra, which now joins the tongue of sand forming Antsiraka point, which has itself extended. There is no settlement now on Maroantsetra, and the whole place is overgrown with bush, chiefly mangroves. The Anjahanambo river coming from the westward runs along just inside the coast for nearly 2 miles before it discharges into the bay at the same place as the other river; between it and the sea is a long belt of sand from 20 to 80 yards wide, with trees nearly its whole length. On the northern bank of this last river is the new village of Maroantsetra, partly native and partly European, with Custom-house and Telegraph station.

Boats cannot safely enter either river except at high water, though within the bar from 6 to 10 feet will be found in the eastern stream for about 2 miles. Under native guidance, a light whale boat may reach the settlement even at low water.

On the western limit of Port Choiseul is the shoal point Veringotra, which is backed by two pap hills.

Anchorage.—The best anchorage in Port Choiseul, both for shelter and facility of communication, is in the middle of the port in about 7 fathoms, mud. To clear the shoal ground off Antsiraka point keep the eastern side of Nosi Harami touching the south-western extreme of Nosi Marosi. At this anchorage, the water is fresh on the surface and very muddy; it should not be used in the boilers if it can be avoided. If bad weather should set in, the anchorage in Port Memoria, already described, should be taken advantage of.

Tides.—It is high water, full and change, at Port Choiseul at 4h. 0m.; springs rise about 5 feet.

Supplies.—Fresh provisions can be procured, and the river banks abound in wild fowl; oysters of good quality are also plentiful round the shores of Antongil bay.

Chart 758, Cape St. Andrew to Antongil bay.

North-east cove, in the north-eastern corner of Antongil bay, is said to afford a safe and well-sheltered anchorage, but it has not been

General charts 758, 2899, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 7° 40' W.

examined. The bay immediately southward of it, in the bight of which is the village Malailé, has also excellent anchorage.

Current.—During the S.E. monsoon a surface current enters Antongil bay continuously, and generally with some strength: it has been found to run more than one knot during the ebb at spring tides. This strong indraught should not be lost sight of by vessels approaching or passing the bay. It is not an uncommon thing for vessels desirous of making St. Mary's channel to find themselves off Cape Bellone. *See* Caution, page 262; also Currents, page 233.

Directions.—Sailing vessels bound to Antongil bay during the S.E. monsoon may pass either inside or outside St. Mary island. During the N.E. monsoon, St. Mary island should not be sighted, but the passage made direct for Antongil bay, of which either shore may be followed according to convenience. Trading vessels, working out, keep on the eastern side, where the current is generally more favourable; but for anchorage they stand over to the western side, where the depth and nature of the bottom are most suitable.

Local winds.—The sea breeze in Antongil bay is not regular, but at times it blows home to the head of the bay with great strength, raising a disagreeable sea for boats. The swell which is so heavy on the coast generally during August and September is felt at the anchorages and sometimes breaks all round the inner shores of the bay. The land wind comes off about midnight and continues until about 8 a.m. The prevailing wind in the month of May is S.S.E., with much rain; in fact, the rainfall is double that of Tamatave, and the climate very unhealthy.

Tanjona (*Lat. 16° 0' S., Long. 49° 45' E.*), at the northern side of the entrance to the River Tanjona, on the western side of Antongil bay, is the head-quarters of a French timber company working steam sawmills, and exporting timber, cabinet wood, &c., to Europe, Réunion, and Mauritius in sailing vessels of from 400 to 500 tons.

A chain of black rocks showing above water projects eastward and north-eastward about 3 cables from Tanjona point at the southern side of the entrance, and for a less distance from Concession point at the northern side. One of the latter rocks has its head painted white, and has on its summit a flagstaff on which the French flag is generally displayed.

Anchorage.—Trading vessels anchor northward of Concession point and ship their cargoes by barges or flats from a strongly-constructed wooden wharf. Vessels may anchor outside the traders in 9 fathoms, sand, with the flagstaff bearing S. by W. and the mouth

General charts 2899, 7596, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 7° 50' W.

of the small River Fanalaina, which has a remarkable opening not easily mistaken, W. by S. $\frac{1}{2}$ S. On the appearance of foul weather, vessels should quit this anchorage, and run for shelter under Nosi Marosi.

Mananara bay (*Lat. 16° 7' S., Long. 49° 45' E.*) is on the western side at the entrance to Antongil bay, north-westward of Cape Bellone; a considerable river of the same name flows into it from the westward. The position may be known by the long, low, wedge-shaped point, having the highest part towards the West; it is of a darker colour than the neighbouring coast. There is also a rocky islet near the shore, N.N.W. from the landing, crowned with pine apple plants and one tree near the centre. The village straggles from the landing place to the northward, some few cottages being on the northern side of the river, which latter is navigable for boats for at least 4 miles, but the entrance should not be attempted by strangers in ships' boats. Natives in surf boats will come off to vessels anchoring in the bay.

Fort Soavinaro lies about 2 or 3 miles up the river.

Reefs.—South of Tanjona, the coast is closely bordered by numerous black rocks, always easily seen, but in Mananara bay, reefs recommence and are always of greatest extent near projecting points. About N.N.E. from the islet there is a reef with $1\frac{1}{2}$ fathoms over it, not steep-to and with uneven ground around it, on which the sea breaks heavily during south-easterly winds, though it scarcely shows in fine weather; there is a narrow passage between the reef and the islet. A 5-fathoms patch also exists off the northern end of the reef; it does not always break the heavy swell which rolls in, and therefore affords little or no shelter to vessels at anchor.

Anchorage.—The best berth, with good holding ground, is with the islet bearing S.E. $\frac{1}{4}$ S. and the river entrance S.W. by S. The landing at the village is good, the shore being sheltered by the islet and outlying reefs.

Directions.—On approaching the anchorage, a wide berth should be given to Amorona point, on the eastern side of the bay, as the reef extends some distance off, and the sea does not always break; also, avoid the detached $1\frac{1}{2}$ -fathoms reef. The mark for entering is the flagstaff, bearing S.W. by S.; that line leads to good anchorage in 6 fathoms, at 3 miles from the village.

Cape Bellone is a mass of high rounded rock; it may be seen at distance of 30 or 40 miles in clear weather, forming an excellent landmark for vessels approaching from the eastward. It is the northern termination of the mountain chain

General charts 2899, 759b, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 7° 50' W.

which joins the coast at Fénérive, and follows it without interruption, except where fronted by the long low projecting Larrée point. From Cape Bellone to the southward, the fringing reefs continue; they are steep-to, always break, and with a careful lookout may be passed close-to.

THE COMPASS.—Local magnetic disturbance.—It has been supposed, and from time to time reported, that the action of the compass is uncertain in Antongil bay and at other places on this coast, as well as in various other parts of the world, and this has been attributed sometimes to the weather or to anything but the right cause. In the few localities where such irregularities exist at all, the cause is to be found in the nature of the bottom over which the vessel happens to be passing, and therefore the mariner, on observing this phenomenon, should immediately by soundings ascertain the depth in the vicinity, and by bearings or angles fix the exact position of the ship and report the occurrence as soon as possible.

General charts 2899, 759b, 597, 748a, b.

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CHAPTER VII.

MADAGASCAR.—EAST AND SOUTH COAST.—ANTONGIL BAY TO
CAPE ST. MARY.

(*Lat. 16° 10' S. to Lat. 25° 40' S.*)
(*Long. 50° 10' E. to Long. 45° 0' E.*)

VARIATION IN 1911.—Decreasing 5' to 7' annually.

Charts 759b, 760.

GENERAL REMARKS.—The coast under consideration in this chapter is no less than 670 miles in length, and, in general, so straight that were a line drawn direct from Foule point, 30 miles northward of Tamatave, to Ytapére point, the south-eastern extreme of the island, a distance of about 459 miles, the coastline would in no case lie more than 7 miles eastward or 4 miles westward of that line. In the whole distance there is not a single good harbour; St. Lucia bay is the best for small vessels, but Tamatave the most important. Besides these, the principal places of call are Port St. Mary, Andovoranto, Vatomandri, Mananzari, Farafangana, and Fort Dauphin.

Chart 759b, Antongil bay to Ambatosoa. Var. 8° W.

THE COAST, from Cape Bellone, the western point of Antongil bay, to St. Mary channel, is high, abrupt near the sea, and thickly wooded. Vessels should keep at least 2 miles off-shore to avoid Nosi Antafa, and also the reefs in the neighbourhood of Cape Lohatrazana, which, for some distance, appear to extend $1\frac{1}{2}$ miles from the coast.

Nosi Antafa (*Lat. 16° 21' S., Long. 49° 53' E.*), surrounded by rocks, lies in a recess of the coast between Capes Bellone and Lohatrazana; it is low, and when seen more than 2 or 3 miles distant appears as two islands; the smaller part, to the southward, is wedge-shaped, the other long and terminating in a cluster of rocks. The dark vegetation on the island contrasts with the lighter tint of the mainland.

Plan of Tangtang harbour on 680.

TANGTANG or **Tintingue**. — This harbour, about 30 miles southward of Cape Bellone, and 18 miles westward of the northern end of St. Mary island, lies in the bight on the northern side of Larrée point. It was visited and imperfectly surveyed by the French corvette *Chevette* in 1829, but since

General charts 2899, 597, 748a.

Plan of Tangtang harbour on 680. Var. 8° W.

then another French corvette has been wrecked in attempting to enter, and beyond this there is no further information. It appears as though in its inner north-eastern bay, between Tangtang point and the entrance of the River Manompana, it must be perfectly protected from all winds by the neck of land and reefs, with a depth of about 4 fathoms. The shore reef on the western side extends from the river's mouth 3 or 4 cables, increasing to nearly one mile at the entrance; and the whole of the harbour, about 3 miles in extent from entrance to head, though with apparently several open spaces available for anchorage, has many small rocky patches with only a few feet over them.

According to the *Chevette* there are three passes through the reefs into this harbour, viz., the Golo pass, the most northern, between the reef extending southward from Tangtang point, and some detached banks southward of it, all steep-to, with central depths of from 8 to 11 fathoms. Next, the Royal or Middle pass, between the detached banks just mentioned and others southward of them, together with part of the shore reef. And, thirdly, the Southern pass, between the second detached banks, mentioned above, and the shore reef.

As no vessel should attempt to make use of either of these channels, or of the port itself, without first thoroughly examining it and buoying a passage, any further attempt at description would be useless, and probably misleading.

Tides.—It is high water, full and change, at Tangtang at 4h. 30m.; springs rise about 6 feet.

Chart 683, Island of St. Mary.

Larrée or Antsiraka point.—Anchorage (*Lat. 16° 48' S., Long. 49° 46' E.*). — Southward of Tangtang the coast projects eastward 8 miles beyond the general coastline, forming this low sandy point some 8 miles wide at the base, but terminating sharply, and its extreme extending to within 4 miles of St. Mary island, between which and it is a deep channel. Sandy shoals extend nearly 5 cables eastward of the point, and also along its northern side until about one mile westward of its extreme, the green colour of the water indicating their limit. Westward of this, and up to the entrance of Tangtang harbour, there is excellent anchorage in from 16 fathoms at one mile from the shore to 10 fathoms at only one or 2 cables from the beach, with a bottom of hard mud, good holding ground, and smooth water whatever the force of the wind, if it be from S.E. through South to West.

Larrée point is only visible from the deck at a distance of about 10 miles in clear weather. Canoes land easily on the northern side, and from the anchorage, or directly after rounding the point from the

General charts 759b, 2899, 597, 748a.

Chart 683, Island of St. Mary. Var. 8° W.

southward, a large village can be seen, where fresh provisions may be obtained.

St. Mary channel (*Lat. 16° 55' S., Long. 49° 50' E.*), which separates St. Mary island from Madagascar, is about 14 miles wide, except opposite Larrée point; the depth varies from 33 to 16 fathoms, and less towards the mainland shore. The currents are of moderate strength and variable, but very strong off Larrée point. As a rule they follow the direction of the wind, but the northern set being the stronger, if the wind falls light during the N.E. monsoon, the current becomes reversed, and a sailing vessel then finds great difficulty in getting out of the southern end of the channel.

Anchorage.—Where the water is not too deep, the whole channel may be considered as a fairly secure roadstead; anywhere northward of Larrée point, the holding ground is good, but southward of that point the bottom is loose and sandy, and here the best anchorage is on the island side, where the reefs are steep-to and may be closely approached, whereas, on the mainland side, a heavy sea almost always tumbles home.

Coast.—The description of the coastline southward of Larrée point is continued at page 276, after that of St. Mary island is completed.

ST. MARY ISLAND or **Nosi Boraha.**—This island, including the reef at each end, is 31 miles long N.E. by N. and S.W. by S., but scarcely $3\frac{1}{2}$ miles wide in its widest part, near the centre. It is slightly undulating, the hills are 160 feet high or more, thickly wooded, and when seen from a distance have a very pleasing aspect. At Port St. Mary, where the island is only half a mile wide, it is low and marshy; and throughout the island all the valleys are either beds of rivulets, freshwater marshes, or saltwater marshes covered at spring tides.

The population of St. Mary, which is one of the provinces of Madagascar, in 1910, was 5,327, of whom 75 were Europeans or assimilated, and 27 Asiatics or Africans.

THE COMPASS.—**Local magnetic disturbance.**—The sub-stratum of St. Mary island, and also the bottom of the sea on the same meridian for 50 miles farther South, have been observed to affect the magnetic needle. Observations made in different places in the vicinity of Port St. Mary gave as the result $7^{\circ} 15'$, $6^{\circ} 0'$, and $10^{\circ} 34'$ westerly variation; in the road it was 7° . Extra caution and frequent observations on this point are necessary when within the bank of soundings in this vicinity.

Winds.—During the hot and rainy season from September to April, the wind generally blows from South-west, South, or South-east; sometimes, but very rarely, and generally in February and March, from East and North-east. During the dry season it blows

General charts 759b, 2899, 597, 748a.

Chart 683, Island of St. Mary. Var. 8° W.

from South-east, East, North-east, and North; sometimes from South and South-west. The westerly wind which blows over and from Madagascar, lasts nearly all night and morning; the sea breeze does not begin until midday. Also, during the dry season, the winds are rather feeble about the island, and the sky is serene though rather cloudy; but during the rainy season, the winds are nearly always strong. January, February, and March are the months in which violent squalls and cyclones may be expected. The mean barometric reading is 30·106 inches.

Climate.—Temperature.—There is very little difference between the climate of St. Mary island and that of the neighbouring coast of Madagascar where similar conditions of marshy lands prevail; but St. Mary is as unhealthy as the worst parts of the larger island. The sickly season is considered to be from January to the middle of May. In January and February, the thermometer rises to 98·6° in the middle of the day, and remains between 88° and 91° until night. During the night and until sunrise it is sometimes as low as 70° or 68°. The mean annual temperature is 75·2°; and the minimum in July 66·2°.

The rainy season begins in December and continues until April, and this is the hottest time of the whole year.

From the middle of April to the middle of June the weather is generally fine, easterly and south-easterly winds bringing little or no rain, but a second rainy season begins in the middle of June and sometimes lasts for nearly two months. At the end of October, when the wind begins to turn northward, storms commence in the evening on the mainland opposite, but do not generally extend to St. Mary island until later; by the middle of December they are of frequent occurrence, and the true rainy season then begins. In the interval, the weather generally becomes overcast in the island about 3h. p.m., and this is usually followed by a little rain in the evening.

Soundings, &c.—The soundings along the eastern coast have been very imperfectly taken, but the depth appears to be much less than would be expected on the ocean side of an island bordered by coral reefs. As far as is known, the depths generally along that side, at from 2½ to 5 miles from the shore, only vary between about 14 and 20 fathoms. Reefs and sandbanks extend along this shore nearly the whole length of the island, and at the south-eastern part in some places they are from 2½ to 3 miles off-shore. Off Halbrand point, the north end of the island, they extend about 5 cables.

Pointe Albrand (Halbrand).—LIGHT (*Lat. 16° 42' S., Long. 50° 4' E.*).—A white flashing light, every five seconds, elevated 255 feet above high water, and visible in clear weather from a dis-

General charts 759b, 2899, 597, 748a.

Chart 683, Island of St. Mary. Var. 8° W.

tance of 22 miles, is exhibited in a metal tower, 47 feet high, erected at a distance of about $1\frac{3}{4}$ miles from the extremity of Pointe Albrand or Halbrand.

Ankolabé or Colabé bay.—This creek is about midway along the eastern side of the island, and may serve as a refuge for boats, but the passage has not been surveyed. A white cliff on the shore in rear of the passage, between two points which form the bay, is a good mark by which the entrance may be found.

Whale shoal, or Ankoraka (*Lat. 16° 55' S., Long. 50° 0' E.*), lies eastward of Ankolabé bay, the white cliff bearing W. by N. $\frac{1}{2}$ N. distant $2\frac{1}{2}$ miles. It is detached from the shore reef, and is about 8 cables in extent at low water, springs; the central part shows above water as a sandy islet.

Saphir bank was discovered by a merchant schooner of that name in 1881; it lies 11 miles E. $\frac{1}{2}$ S. from Blève point; it consists of coral and sand, and is about $1\frac{1}{2}$ miles in extent, with 14 fathoms at the East and West extremes, and 8 fathoms near the centre.

Anchorage. — Battaru (Louarea) bay and its vicinity offers good anchorage for large vessels, but is open to the North and West. The bay extends from one to 2 miles south-westward from Halbrand point, the north extreme of St. Mary island, opposite two hills which stand close together very conspicuously in the middle of a depression on the coast. On approaching from the north-westward, the huts of the village will be seen, and a bright sandy point to the southward of them; also, a little farther south-westward, Cocoonut point, low and covered by an abundant vegetation, especially cocoonut palms, and bordered by a white sandy beach. This point is steep-to, but is extended by a sandy shoal in a W.N.W. direction, which, however, ends abruptly about 250 yards from the shore.

At $1\frac{1}{2}$ miles off-shore the depth decreases from 22 to 14 fathoms. A vessel may anchor 5 or 6 cables closer in, with the sandy point bearing S.S.W., and the extreme of the reef off Halbrand point E. by N., or anywhere along the shore within that distance of it, between Halbrand and Cocoonut points, the holding ground being good, and the depth decreasing gradually towards the shore.

Blève point (Pointe Blevec), usually considered the southern point of St. Mary island, is actually the South point of Ile des Nattes, which is $1\frac{3}{4}$ miles in length, low, and separated from the larger island by a narrow channel running in a N.N.W. direction and used by large boats at all times of tide; at half tide, boats can pass round the South side of Ile des Nattes over the

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Chart 683, Island of St. Mary. Var. 8° W.

reef, which extends from the island $1\frac{1}{2}$ miles south-westward and south-eastward; over the centre there are from 3 to 7 feet at high water.

LIGHT (*Lat. $17^{\circ} 8' S.$, Long. $49^{\circ} 50' E.$*).—On the south-western edge of Bléve reef, about one mile S.S.W. $\frac{3}{4}$ W. from Bléve point, is a small red structure on piles, from which is shown a *fixed white* light, visible in clear weather from a distance of 8 miles. This light cannot, however, be implicitly relied on. For arc of visibility, *see* Light list.

Lukensie bay, on the west coast, nearly East of Larrée point, affords good anchorage for large vessels, but is open to the North and North-west. Good water may be procured here in abundance.

Point Tafondru, which forms Lukensie bay, is reported by the *Hugon* as being placed on the chart nearly a mile too far northward, it being in fact almost on the same parallel as Larrée point. This is also the case with the coast to the southward as far as Port St. Mary, which is correctly placed.

Plan of Port St. Mary on 683.

PORT ST. MARY is on the western side of St. Mary island, 8 miles north-eastward of Bléve point and about $9\frac{1}{2}$ miles southward of Larrée point. It is not considered safe in a cyclone.

A settlement was first made at Port St. Mary in 1642 by the French East India Company, but was subsequently deserted; in 1745, another garrison was sent, which was destroyed by the natives in 1754 on suspicion of the governor having taken treasure from the grave of a chief; this was avenged by a massacre of the islanders. Again, in 1821, the French took possession for a third time, unfortunately landing at the commencement of the sickly season, which reduced their number from 290 to 130 during the first three months. It is now the capital of the province.

The harbour lies in the bay between Sorciers point and the Baleine rock, $1\frac{1}{2}$ miles apart, and is formed by the opening between Madame islet and its reefs, and the reefs projecting from the eastern shore. The large area south-eastward of Madame islet consists of coral shallows only just covered, but the French government has commenced dredging and other works for the utilising of a portion of this space; the small area of deep water is sheltered by Madame islet, which islet is occupied by government buildings, &c., and is 415 yards in length N.E. and S.W.: here there is also a gaol in which native political prisoners from Madagascar are confined. This small natural harbour is sufficiently deep for a vessel drawing 23 feet to enter and lie alongside the quay, which occupies the inner side at the north-eastern end of the islet; a vessel drawing $16\frac{1}{2}$ feet may secure to the quay running North and South in

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Plan of Port St. Mary on 683. Var. 8° W.

front of the Governor's residence. A stone jetty, suitable for lighters only, extends 100 yards from the eastern side.

Madame islet is enclosed by a reef on the outer side, which extends one cable off and also unites it with the coast to the southward. Another small islet in the middle of the reef on the north-western side is connected with the larger islet by an embankment. The only entrance to the port is round the northern side of Madame islet, which was formerly united to St. Mary island by two wooden foot bridges, one to the eastward and the other south-westward; both have been destroyed, and communication is now maintained by ferry. A suspension bridge was commenced from Madame islet to St. Mary island a little southward of the church, a white building forming a good sea-mark; in 1896 some piles of masonry alone remained. A flagstaff and light gibbet stand at the North extreme of Madame islet.

The remains of the French man-of-war, *La Bourdonnais*, wrecked in 1886 on Madame islet, are still visible.

Within the harbour, in shallow water south-eastward of Madame islet, is Forbans islet, covered with verdure; a stone causeway connects it with the coast to the northward. Coal stores are established on this island; their pointed roofs, showing amongst the trees, make a very good mark for the anchorage.

Sorciers point, on the northern side of the port, and half a mile northward of Ambutifuth village, is a small hill marked by whitewashed rocks to distinguish it.

Baleine rock or Square Tower rock is nearly 8 cables W.S.W. from Madame islet light; it is a high black rock with a conspicuous white tower and flagstaff on it, making a good landmark.

LIGHTS (*Lat. 17° 0' S., Long. 49° 54' E.*).—On a rock off western extreme of Sorciers point, at an elevation of 52 feet above high water, is exhibited a *fixed* light with a *white* and a *green* sector, visible in clear weather from a distance of 10 miles. For sectors, see Light list and chart.

At 17 yards within the northern end of Madame islet, from a white gibbet, is exhibited, at 31 feet above the sea, a *fixed red* light, supposed to be visible from a distance of about 4 miles.

A small *white* light in front of the Residence is shown for harbour use, and is occasionally, on some bearings, to be seen from a short distance seaward.

St. Mary road.—Depth.—Shoals.—At 7 cables from the shore in the neighbourhood of Port St. Mary, between Sorciers point and Baleine rock, the depth appears to be upwards of 20 fathoms, and at 5 cables it is upwards of 10 fathoms, but immediately within that distance are several dangerous rocky patches of from $2\frac{1}{2}$ to $4\frac{1}{4}$ fathoms. The outermost of these, a $4\frac{1}{4}$ -fathoms bank, lies W.S.W. southerly distant 5 cables from Sorciers point, with from 10 to 16 fathoms.

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Plan of Port St. Mary on 683. Var. 8° W.

around. There is also a $3\frac{1}{2}$ -fathoms coral reef 2 cables N.W. by N. from Madame islet light, which is separated from the island reef by a channel one cable wide, with from $5\frac{1}{2}$ to $6\frac{1}{2}$ fathoms.

Buoys.—A spherical buoy, painted with red and black bands, and from which a *red fixed* light is shown when mail steamers are under way, marks the $3\frac{1}{2}$ -fathoms shoal.

A white buoy marks the north extreme of the 3-fathoms line off Madame islet.

Directions.—Vessels from the southward should run along the western side of St. Mary island in 18 or 20 fathoms, or farther off if under sail, so as not to lose the wind, until Baleine rock tower bears East, when Madame islet, with its houses and government buildings, will open out.

Approaching from the northward, its position will be recognised by its distance southward of Larrée point. It is the only place on St. Mary island where constructions in masonry are to be seen, with the exception of the remains of a sugar factory at Antsarak, $12\frac{1}{2}$ miles farther North, and consequently northward of the parallel of Larrée point.

At night.—Keep the *red* light on the buoy in line with Madame islet *red* light, and anchor when in the *green* sector of Sorciers point light.

Anchorage (*Lat. 17° 0' S., Long. 49° 54' E.*). — The best berth in the roads is just outside the light-buoy, with the light and church in line S.E. by S. and Baleine tower S.W. $\frac{1}{2}$ S., in about 11 fathoms, sandy mud. If surprised in this roadstead by bad weather from the southward or south-westward, vessels should run at once for shelter under Larrée point, as described at page 269. Vessels drawing less than 19 feet may take shelter behind the light jetty, or they may moor in from $4\frac{1}{4}$ to 6 fathoms at from $1\frac{1}{2}$ to 2 cables from the light jetty, between the bearings N. by W. and N. by E. from the light.

Pilotage.—A pilot will go out from the port directly the approach of a vessel is signalled from Baleine tower; the charge is 25 francs, irrespective of tonnage or draught of water.

Tides.—It is high water, full and change, at Port St. Mary, at 4h.; springs rise 5 feet.

Communication.—The Messageries Maritimes mail steamers call monthly; on the 15th or 16th outward bound, and on the 19th homeward bound.

A system of optical telegraphy will shortly be instituted to connect St. Mary with Madagascar, viâ Soanierana.

Trade.—The cultivation of cloves is the principal industry, but coffee, cocoa, vanilla, and many kinds of fruit are also grown. The value of imports in 1910 was £2,305, and exports £7,108.

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Plan of Port St. Mary on 683. Var. 8° W.

The number of vessels that entered the port in 1910 was 173, of a total tonnage of 65,152 tons.

Coal.—The French Government keep from 1,000 to 1,200 tons of patent fuel in stock.

Water.—Two streams flow into the harbour, and there is a well on Madame islet; but water of good quality can be obtained at the regular watering place at the inner part of the harbour.

Supplies.—Fresh provisions are scarce, 24 hours' notice being required.

Small coasting craft have been built at Madame islet, and an attempt made to train native shipwrights, but no large repairs can be reckoned on. The best timber has disappeared from the neighbouring forests.

There is a heaving-down wharf, a hospital, and storehouses.

Chart 683, Island of St. Mary.

COAST of Madagascar (*continued from page 270*).—The constant swell from the south-eastward setting into the bay southward of Larrée point renders landing on this coast anywhere, even in the finest weather, very hazardous in ordinary ships' boats, and, under ordinary circumstances, not to be attempted. Anchorage is sometimes taken up in about 10 fathoms off the mouth of the River Marimbo, where the village of Soanierana and flagstaff are plainly visible from the offing, and where communication may be had with the shore by the river, but only by means of the canoes of the country. Streams of more or less importance flow into the sea every 5 or 6 miles when southward of the base of Larrée point, but the first of any importance is that now to be described.

Chart 759b, Antongil bay to Ambatosoa.

The River Manangoro (Maningori) has its source in Lake Alaotra, and is one of the largest and deepest on the eastern coast of Madagascar. The entrance, rendered impassable by a bar, is 30 miles S.W. $\frac{1}{2}$ W. from Larrée point. Near the entrance, at Ambazaha village is a stone elephant measuring 7 feet by 4, said by tradition to have been brought from Mecca. On the northern side of the river, the hills approach the sea and form a point, beyond which a low coast extends 8 miles N.N.E., when the hills again approach the shore, which is bordered by reefs 2 cables wide. The soundings off this coast are moderately regular, and 7 fathoms are found at one mile from the beach. Southward of Manangoro, a low coast lightly wooded extends S.S.W. 11 miles to Fénériver.

Outlying and doubtful shoals between St. Mary island and Foule point.—**Fry shoal** (*Lat. 17° 20' S., Long. 49° 36' E.*).—In 1871, breakers were seen from Fénériver point,

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Chart 759b, Antongil bay to Ambatosoa. Var. 8° 20' W.

bearing E. by N. $\frac{1}{4}$ N. at an estimated distance of 8 miles. Some 15 years later, during a calm and heavy swell, the *Romanche* saw breakers several times in the same direction; and, in 1890, breakers were seen in the same place from the masthead of the cruiser *D'Estaing*, when about one mile distant. In 1884, the French ship of war *Boursaint* searched in vain for this shoal on the bearings given, and found nothing less than 10 fathoms. This supposed bank is marked as the Fry shoal on the chart.

Capricorn Bank (*Lat. 17° 30' S., Long. 49° 35' E.*).—In October, 1884, the French gunboat *Capricorn* examined a bank which an experienced seaman of Fénérive had pointed out as a 26-foot shoal, lying 11 miles S.E. by E. from Fénérive point, nearly in the track of vessels between Tamatave and St. Mary. Though numerous soundings were taken, and the water was very transparent for more than a depth of 11 fathoms, nothing less than 11 fathoms was found. The bank was then described as not more than 6 or 7 cables in length, N.E. and S.W., and about half that width. It is now shown on the chart as being 5 miles long N.N.E. and S.S.W., with $6\frac{1}{2}$ fathoms at the southern end and $3\frac{3}{4}$ fathoms at the northern end (P.D.), and lying about 8 miles off-shore between E. by S. and E.N.E. from Mahambo point.

In 1882, Captain Nourse passed over a bank near this position, viz., 12 miles N.E. by N. from Foule point, finding from 12 to 7 fathoms, sand and rock.

CAUTION.—As regards these detached outlying shoals, Captain Denis says that the *Hugon* passed up and down this coast several times, and although a good lookout was kept, no trace of either of them was ever seen. Nevertheless, from the repeated reports, it can hardly be doubted that foul ground exists in these localities, and the difficulty of finding small coral rocks is well known; therefore, when navigating in these parts, the utmost caution should be observed.

Plan of Fénérive on 686.

FÉNÉRIVE or Fenoarivo.—This bay is about 26 miles S.W. by W. $\frac{1}{2}$ W. from Bléve point light. Its position may be known principally by the sudden elbow formed by the trend of the coast at Takondro point and a group of detached hills about 3 miles to the southward. Also, by Nosi Ilainsambo, a small island 6 cables E.S.E. from Fénérive point, and 2 cables from the shore, but with no passage between it and the shore. It is slightly raised, covered with trees, and bordered by a sandy beach above a continuous reef extending 2 cables north-eastward, on which the sea breaks heavily. These reefs cause

General charts 2899, 597, 748a.

Plan of Fénérive on 686. Var. 8° 20' W.

the island to stand out well when approaching from the south-eastward; but from the north-eastward it is not distinguishable from the land behind it until within 3 or 4 miles.

Allier reef (*Lat. 17° 22' S., Long. 49° 29' E.*), with 3 fathoms, is a small coral rock lying E.N.E. distant 14 cables from the flagstaff on Fénérive point, and is surrounded by depths of 7 and 8 fathoms; but about a cable E. by S. from it there is a small $5\frac{1}{4}$ -fathoms patch.

Ville de Pernambuco rock, on which a vessel of that name struck, lies S. by W. $\frac{1}{2}$ W. a distance of $4\frac{1}{2}$ cables from Allier reef. About $7\frac{3}{4}$ cables south-eastward from this rock is a shoal with $3\frac{3}{4}$ fathoms, its position is only approximate.

Other reefs and patches lie around the bay but are well within the 5-fathoms line, and none extend so far from the shore as that described bordering Nosi Ilainsambo.

Village.—At the inner recess of the bay, on the small cliff called Fénérive point, stands the large village which gives its name to the point and bay. The population varies at different seasons, the average being about 2,000. On the western side of the point is a shallow rivulet, which disappears a short distance inland.

Vohemaso (Vohimasina) **Fort** is about $1\frac{1}{4}$ miles S.W. by W. from Fénérive village, on a flat-topped hill, with a marsh and water-course between it and the sea coast. It can be seen at a great distance, being higher than other hills in the vicinity and without trees.

Directions.—Approaching from the south-eastward, pass about a mile from Takondro point, and then steer N. by W. $\frac{1}{2}$ W. nearly 4 miles, or until Vohemaso flagstaff bears S. 49° W.; then run in on this bearing until Fénérive point flagstaff is sighted. The flagstaff at the point can only be seen from a small distance, as it is amongst thick trees. This clears the dangerous Allier bank, and leaves to the southward all known dangers. Vessels should not pass within the space comprised between the Allier reef and Nosi Ilainsambo, nor southward of the line drawn through the two flagstaffs on account of Ville de Pernambuco rock, and also those knowing this locality say there are other dangers as well as a ballast bank.

Vessels from the northward should coast along keeping about 2 miles off-shore. Fort Vohemaso will be seen at a good distance, and may be run for when in line with a single cluster of trees on a chain of hills behind it, bearing S.W. $\frac{1}{2}$ W. That line leads in until the flagstaff on Fénérive point comes in sight, when proceed to the anchorage.

Anchorage off Fénérive is dangerous during the winter, and very bad at all times, being open to wind and swell; the sea frequently breaks in places near the anchorage, though the depth may not be less

General charts 759b, 2899, 597, 748a.

Plan of Fénérive on 686. Var. 8° 20' W.

than 7 fathoms, and even the depth is said to be on the decrease. The holding ground is only fair, and it should only be used as a temporary stopping place during the fine season, from April to October, when a vessel should anchor in $4\frac{1}{2}$ fathoms, muddy sand, a little North of a line drawn through Vohemaso battery flagstaff and the flagstaff on the point; or, if apprehensive of bad weather, farther out in 6 fathoms, gravel and sand, with Takondro point just open.

Landing is difficult, notwithstanding the partial shelter afforded by Fénérive point, as the swell sets round it. Boats must approach with caution the surf through which they have to pass, and should go close to the cliff, between it and a half-tide rock to be left on the starboard hand.

Supplies.—Trade, &c.—Fénérive has the advantage of water communication by canoes with the interior for a considerable distance, by which means supplies are conveyed to the coast at small cost. Rice, potatoes, cattle, pigs, poultry, and an abundance of game may be obtained; and oysters of excellent quality are plentiful. There is no coal, nor any assistance in case of repairs being required. The exports are principally rice, hides, wax, rubber, coffee, and rofia. The imports are cotton goods of all kinds, hardware, pots, crockery, &c.

Takondro point (*Lat. 17° 25' S., Long. 49° 30' E.*) is about 3 miles south-eastward of Fénérive, it is moderately high and covered with trees; between it and Nosi Ilainsambo, the coast is fringed by a wide reef. At $5\frac{1}{2}$ cables E. by N. $\frac{1}{2}$ N. from Lakariana point is a $3\frac{3}{4}$ -fathoms patch, therefore, when approaching from the southward, keep at least a mile off-shore.

Chart 759b, Antongil bay to Ambatosoa.

Coast.—Between Fénérive and Foule point, a distance of nearly 20 miles, the coastline is irregular, presenting a series of beaches and rocky points, and bounded by rocks especially off the points, from which reefs extend seaward as much as 5 or 6 cables, as may be seen by the breakers. The land near the coast is a succession of sandhills, covered with trees, having no peculiarity by which to distinguish one part from another, except the reddish colour of the ground about Mahambo. In the background are high wooded mountains receding south-westward from the coast.

Mahambo.—About 5 miles southward of Takondro point is Mahambo village, consisting of one long street from the beach and terminating half a mile westward of the beach and a mile from the eastern point, in a circular battery of red sandstone called Tsarasao tranitomponi. The eastern point may be known by the cocoanut and

General charts 2899, 597, 748a.

Chart 759b, Antongil bay to Ambatosoa. Var. 8° 30' W.

other trees which grow down to the extreme end. The red ground on which the battery stands is also very remarkable from the sea.

Bitt rock.—To the North-west, between Mahambo and the Sirt rivulet, three points, surrounded by rocks, project from the shore. On the reef which prolongs the second point to seaward is a remarkable rock resembling a ship's bitt, and hence called the Bitt rock.

Penelope's Pie is connected with the reef from the third or western point, and is so called from a vessel of that name having been lost on it. It is the outer patch in that part of the bay, and should be carefully avoided, as it extends some distance under water and is very dangerous.

The third or western reef is very irregular, and throws out spurs towards the bay, while that from the second point, on which is the Bitt rock, is steep-to, the sea only breaking near the point.

Mahambo village is on the northern side of the second point. It has some little trade, exporting small quantities of rice, bullocks, tobacco, hides, &c.; the imports are chiefly cotton stuffs.

Anchorage.—The best anchorage, but only practicable for small coasting vessels, is in about 5 fathoms off the village, and the Bitt rock is a sufficient guide to it; for, being well marked by breakers and steep-to, it should be rounded closely, whilst the Penelope Pie side should be as carefully avoided. Larger vessels must anchor outside the reefs and exposed to the swell.

Plan of Foule point anchorage on 686.

FOULE POINT, or Rafala (*Lat. 17° 40' S., Long. 49° 33' E.*).—This part of the coast may be known by the high white sand mounds, which can be seen from 15 to 20 miles distant in moderately clear weather, there being very little wood except on their summits, and they also show well against the tufted vegetation behind them; a plantation of cocoanut trees, the only one in the vicinity, and a white cliff a mile southward of the village, help to mark the position. Next to Tamatave, the sea is said to break more heavily on this point than elsewhere along this coast.

Village and fort.—The village is about 10 miles southward of Mahambo; it is large, irregularly built, with narrow streets, on low ground, and is nearly surrounded by lakes of stagnant water swarming with crocodiles; these lakes extend from the River Iharana to the vicinity of Mahambo, a distance of 19 miles. The Hova fort, Mahavelona, with its flagstaff, stands on a hill about 5½ cables westward of the old landing place, and half that distance from the sea. Foreign traders live near the sea side and occupy the best houses.

General charts 2899, 597, 748a.

Plan of Foule point anchorage on 686. Var. 8° 30' W.

Reefs.—The most prominent part of the coast, $1\frac{1}{2}$ miles southward of the village, is enclosed by a reef extending $2\frac{1}{4}$ miles to the northward, with a width of from 5 to 8 cables; the outer side is not steep-to. Between it and the shore is a narrow boat passage, having in one part a depth of 4 or 5 fathoms close to the sandy point. There is also an inner reef in the bay northward of the village.

Chart 759b, Antongil bay to Ambatosoa.

About 4 miles N.N.E. from Foule point is a coral bank with $6\frac{1}{2}$ fathoms over it, 10 fathoms inside, and 16 or 17 fathoms outside it; this is believed to be the only outlying bank in the immediate vicinity, but *see* also page 277.

Plan of Foule point anchorage on 686.

Boat creek (Lat. $17^{\circ} 40' S.$, Long. $49^{\circ} 34' E.$).—Within the reef, near the sandy point, is a natural creek affording shelter for small vessels in about 5 fathoms. The bottom is very irregular, and hemp cables are quickly cut by the sharp coral rocks. Great caution is necessary, both on entering and leaving, to ensure keeping in the right channel. The current nearly always runs to the northward.

Landing place.—There is good landing in the boat creek on the southern side of Foule point; the old landing place on the northern side is bad, and a dry landing can only be effected there on men's backs, as the shore is very flat and uncovers a long way out.

Directions.—When approaching in a sailing vessel from the eastward, make the land well southward of the port, to allow for possible northerly current; the northern end of the great reef should be rounded at a distance of 3 cables, to clear the detached $3\frac{1}{4}$ -fathoms reef; but it may be desirable to keep farther off or to look out from aloft, in order to see the flagstaff on the Hova fort, the fort showing very little above the trees.

Anchorage in Foule bay is safe during the fine season, from April to October, when the prevailing winds are from South to South-east. It is open to North and North-east winds, but these seldom last long and do not raise a high sea. A good berth is in 6 or 7 fathoms, with the flagstaff on the Hova fort bearing about S.W., the low sandy point from S. $\frac{1}{2}$ W. to S. $\frac{1}{2}$ E., and the northern end of the great reef E.S.E. or E. by S. Vessels may, if desired, anchor 2 cables farther southward and find less swell towards the entrance of Boat creek, in $5\frac{1}{2}$ fathoms, with the Fort flagstaff bearing S.W. by W. $\frac{1}{2}$ W.

Supplies, &c.—Bullocks and rice can be procured, and various kinds of wood. Water can be obtained from the rivulet which empties

General charts 2899, 597, 748a.

Plan of Foule point anchorage on 686. Var. 8° 30' W.

into Boat creek, but a boat has to ascend some distance to get beyond tidal influence. The bay is much frequented by coasting craft, and has some import and export trade, the latter chiefly in bullocks. The trade, however, does not increase, mainly owing to the prevalence of malarial fever, most destructive to European life.

Chart 759b, Antongil bay to Ambatosoa.

COAST.—Immediately southward of Foule point, the coast is bounded by breakers extending one or 2 cables from the shore. From Foule point to Tamatave the land is of moderate height, decreasing towards the southward, uneven, rising by four distinct chains of hills towards the mountains in the interior, and densely wooded. About 12 miles southward of Foule point are the Nate paps, two remarkable hummocks 574 feet high, near the coast, and visible at a distance of 25 miles; about 2 or 3 miles southward of them are two somewhat similar mounds, known as Tamatave paps, not nearly so high, but which might be mistaken for the Nate paps in hazy weather.

As the white sandy shore southward of Nate point is free from danger beyond 2 or 3 cables, vessels should coast along keeping about a mile off-shore, and thus pass within all the outlying dangers reported off this coast. This practice is particularly recommended by day, and also in a clear night, for the land is easily followed by the white line of the breaking swell, as well as by some remarkable objects easily recognised by those with local knowledge.

This coast is intersected by a number of small rivers, which greatly impede land communication between Tamatave and Foule point, and there being no free exit for their waters, the marshy lands thus caused render the country very unhealthy during the hot season.

About 5 miles northward of Tamatave, the coast becomes low and covered with a screen of trees, behind which the ground is slightly uneven. In that space are lakes and marshes extending far inland and communicating with the River Ivolina, which latter is unnavigable and very liable to alteration at its entrance.

Ifontsi, the first village of any importance southward of Nate point, stands on the eastern side of an island formed by the division of a small river into two insignificant streams, and is a stopping place between Tamatave and Foule point. Anchorage may be taken up off Ifontsi or any part of this coast in from 13 to 16 fathoms.

Ifontsi bank (*Lat. 17° 53' S., Long. 49° 35' E.*) has been reported by several vessels, and is now shown as the northern limit of a line of reefs, with depths of from $2\frac{1}{4}$ to 8 fathoms over them, extending in a northerly direction, parallel with the shore, from the North point of Prune island. It has a least depth of 4 fathoms, which is situated E. $\frac{3}{4}$ S. a distance of about $4\frac{1}{2}$ miles from Ifontsi.

General charts 759b, 2899, 597, 748a.

Chart 759b, Antongil bay to Ambatosoa. Var. 8° 30' W.

Marie Eugénie shoal is so named from the vessel which reported it, in 1857, as a bed of rocks with 15 feet over them, on which the sea broke heavily during strong sea breezes. It is now charted S. 18° W. a distance of $2\frac{7}{10}$ miles from Ifontsi bank, and as having a least depth of $3\frac{1}{2}$ fathoms.

Rangazava bank is a detached bank lying between the before described bank and the coast reef; it has a least depth of $5\frac{1}{4}$ fathoms over it, and is situated S.E. a distance of about $2\frac{3}{4}$ miles from Rangazava village, which lies about midway between Ifontsi and Vohidrotra villages.

The *white* sector of Tanio light shows over Rangazava bank, but not over the reefs eastward of it.

Plan 688, Tamatave.

Vohidrotra is a village 6 miles northward of Tamatave, on the bend of the River Ivolina, where that river commences to run southward parallel with the coast for about a mile before falling into the sea. It is reputed one of the most unhealthy places on the coast. The river is large, deep, and abounds with fish and crocodiles. A conspicuous palm stands on the southern side of the entrance to the river.

Prune island (*Lat. 18° 3' S., Long. 49° 30' E.*) or **Nosi Alanana**.—The centre of this island lies $6\frac{3}{4}$ miles N.N.E. $\frac{1}{4}$ E. from Hastie point, $4\frac{1}{2}$ miles from the nearest part of the Great reef, and $2\frac{1}{2}$ miles from the coast. It is low and level with abrupt perpendicular coasts, of coral formation, about 760 yards in length, North and South, and 440 yards wide. The regular dark green foliage of trees, the tops of which are about 90 feet above high water, by which it is covered, renders it remarkable, causing it to stand out in strong relief against the mainland; it can be distinguished at 10 or 15 miles, and, therefore, serves as a guide for vessels bound either to Tamatave or to Foule point.

The island is surrounded by a reef 2 cables wide in all directions but westward, where for some distance it is only half a cable. A landing may be effected on the north-western side in fine weather at a place where a small passage is formed by a break in the reef.

There is a quarantine establishment at Prune island.

North reef.—At about half a mile north-eastward from Prune island commences the southern end of the North reef, which extends $1\frac{3}{4}$ miles in the same direction, has many patches of $2\frac{1}{2}$ and $2\frac{3}{4}$ fathoms, and is surrounded by shoals and banks.

Vessels should not pass between North reef and Marie Eugénie shoal.

TAMATAVE, or Toamasina (*Lat. 18° 9' S., Long. 49° 26' E.*).—This important town is built on a low

General charts 2899, 597, 748a.

Plan 688, Tamatave. Var. 8° 40' W.

sandy neck of land about 400 yards wide, and protruding considerably beyond the general coastline; the extreme of this neck is Hastie point. The European town occupies the entire sea face of the northern side of the neck. At the S.E. extreme, and in the southern part, are a small village and native huts. The Hova village lies westward of the European houses and partly between them and the fort. Great improvements have been made since the French occupation, and, amongst others, Military and Municipal hospitals have been built; there are jetties and wharves, with store sheds and a quay, to protect the town, and several hotels. The fort is about three-quarters of a mile north-westward of the point, and 300 yards from the sea; it is a rudely-constructed square building, with a flagstaff; being on the neck of the isthmus, it commands the town and beach. Tamatave is the capital of the province of that name. In 1909 the population of the province was 160,243, of whom 3,721 were Europeans and 357 Asiatics or Africans. In the same year the population of Tamatave town was 8,761, of whom 3,449 were Europeans or assimilated, and 329 Asiatics or Africans.

A British Consul is stationed at Tamatave.

Tamatave is at present the commercial centre and principal trading port of the whole island, but Majunga on the N.W. coast threatens its position as such. There are several French merchants, but British, American, German, and Swiss houses do a fair amount of business; Indian and Chinese traders are numerous, the latter having more than a hundred establishments, where they deal chiefly in rice and other provisions used by Europeans.

Communications.—The Messageries Maritimes mail steamers call here four times a month (twice outward and twice homeward), the Havre Peninsula Company call at least once a month, and the English Castle line and Oswald line of Hamburg also call. Tamatave is the head of the East coast of Madagascar line of steamers which make two trips a month, one to Fort Dauphin and Durban, the other to Tullear with calls at various coast ports. The time of leaving and arriving at Tamatave are fitted in with the arrival and departure of the mail steamers.

Telegraphic communication is opened with the capital and thence with all the principal places in the island, as well as with the world by cable from Majunga, and there is a submarine cable from Tamatave to Réunion and Mauritius. Tamatave is in telephonic communication with Antananarivo. An excellent road has also been made to the capital for wheeled traffic. A steam tram runs from Tamatave to Ivondrona, a distance of about 6 miles, and from thence to Brickaville there is a regular service of small steamers on the Pangalana canal; in 1908 the section of railway connecting Tamatave to Brickaville, and thence with Antananarivo, was commenced.

Climate. — The vicinity of swampy ground renders Tamatave

Plan 688, Tamatave. Var. 8° 40' W.

unhealthy, especially from November to February inclusive. The principal climatic diseases are intermittent fever and malarious dysentery.

Wind.—The prevailing winds are from S.W. to S.E. throughout the year; in May, June, July, and August it seldom blows from any other quarter, but during the rest of the year southerly winds are subject to interruption by those from the northward and eastward. There is usually a hard gale about the March equinox, with which exception the winds are generally moderate. A northerly wind is considered unhealthy, and is called the fever wind; see also page 233 and Meteorological table in Appendix.

It has been said that cyclones rarely blow home to the East coast of Madagascar, but danger may arise from placing too much reliance on this, for four of great violence have been recorded in recent years, viz., in 1876, 1885, 1888, and December, 1904, the latest one being one of the most violent and extensive. See page 12.

Trade.—The trade is subject entirely to the general French Customs Tariff. In 1910 the port of Tamatave imported and exported more than Diego Suarez and Majunga combined; the total value was—imports £469,780, exports £613,244. The exports, except those to France, are mainly live stock to Mauritius, Réunion, and South Africa.

The number of vessels entered in 1910 was 323, with a tonnage of 251,268 tons. This represents 17 per cent. of the total shipping of Madagascar.

Aspect.—The land about Tamatave (*Lat. 18° 9' S., Long. 49° 26' E.*), though not flat, is low, consisting of small hillocks, and is difficult to recognise from seaward, but the high land behind may be seen 35 miles distant. In making the land from the north-eastward, the Nate paps, Tamatave paps, the 777-foot cone, 10 miles S.S.W., and then Prune island will appear. Next, on Tanio point, where an old Hova fort formerly stood, are large military buildings with red roofs which will be seen before the trees on Hastie point are visible; they, with the lighthouse and flag-staff on Tanio point, the lighthouse on Hastie point, and the houses in the town, may be seen 9 miles distant; the sandy beach to the southward is also conspicuous, and the breakers on the outer reefs may be seen 4 or 5 miles distant.

Current.—There is no difficulty in making the port, except that caution is necessary on account of the uncertainty of the current, for at the same season and apparently under similar circumstances a vessel may be set 10 or 12 miles either North or South. With south-easterly winds, no reliance can be placed on a current setting northward; but with winds from N.E. to North, comparatively rare, a

General charts 759b, 2899, 597, 748a.

Plan 688, Tamatave. Var. 8° 40' W.

fairly strong current will generally be found setting southward. On the whole, it is best to be prepared for this latter, and, therefore, if from the eastward, to make the land between the Nate paps and Prune island (*see also page 282*). The best time for making the land is between 7h. and 10h. a.m.

Depths.—There is a least depth of $5\frac{1}{2}$ fathoms in the North pass and 8 fathoms in the East and South passes; from 9 to 13 fathoms at the anchorages, and 19 feet alongside the jetty.

Beacons.—There are two beacons near the village of Salazamay, nearly 3 miles northward of Tanio point, one on the coast, the other N. 81° W. distant half a mile from it; the front beacon is a triangular pyramidal beacon of masonry 41 feet high, painted with black and white horizontal bands; the rear beacon is of masonry, pyramidal in form, 41 feet high, and painted same as the first beacon. In line they lead through East pass.

There is a masonry beacon at Ampanalana, about one mile southward of Salazamay.

LIGHTS.—**Tanio point** (*Lat. $18^{\circ} 8'$ S., Long. $49^{\circ} 26'$ E.*).—From a metal tower, 42 feet high, and at 65 feet above high water, is exhibited a *fixed* light, showing *red*, *white*, and *green* sectors, the *white* light being visible from a distance of 13 miles, the *red* and *green*, 5 miles. For sectors, *see* Light list and charts.

Beacon light.—A red iron structure stands on the coast 192 yards S. 38° E. from Tanio point lighthouse; it is surmounted by a white pole and two open lozenges, joined, with their long diagonals placed vertically and having their planes perpendicular to each other. One of these planes is normal to the axis of the channel. These lozenges are painted white with a black horizontal band, 3 feet high, in the middle. The iron pile which supports the topmark is covered with battens, painted white, on three faces, and having halfway up a black horizontal band, 3 feet wide. The height of the beacon is 31 feet above the ground and 33 feet above high water. From it is exhibited, at 28 feet above high water, a *fixed white* light of about one-third the power of Tanio point light. The beacon and lighthouse by day or their lights by night, in line N. 38° W., form the leading mark for the South pass.

Hastie point.—From a metal tower, 28 feet high, and at 33 feet above high water, is exhibited a *fixed* light similar to that on Tanio point, except that the *white* light is visible from a distance of 10 miles only, and the coloured lights 4 miles. For sectors, *see* Light list and chart.

Harbour lights.—On the pierhead, between the two cranes and at 43 feet above high water, is exhibited a *fixed red* light.

General charts 759b, 2899, 597, 748a.

Plan 688, Tamatave. Var. 8° 40' W.

Beacon.—Amiot head beacon, on the north-western edge of Hastie point reef, about 430 yards south-eastward from the pierhead, consists of an iron pile, painted with black and red horizontal bands; on the pile and 16 feet above high water is a lantern, from which is exhibited an unwatched *fixed red* light, visible all round the horizon. The light cannot be relied on in bad weather.

REEFS.—**Three-fathom reef** (*Lat. 18° 5' S., Long. 49° 29' E.*) lies $1\frac{1}{4}$ miles S.S.W. from Prune island; it is a coral bank with as little as $2\frac{3}{4}$ fathoms and many patches of 3 fathoms over it, on which the sea frequently breaks.

A *red* and *green* sector of Tanio point light shows over the reef.

The Great reef.—At 6 cables eastward of Tanio point commences the western side of this reef, which forms the principal protection to the anchorage off Tamatave; it is 5 cables wide, and nearly $1\frac{1}{2}$ miles long N.N.E. $\frac{1}{2}$ E. and S.S.W. $\frac{1}{2}$ W. The western edge is visible at all times, and can be approached with perfect safety to a distance of one cable. A sandy spit extends from the southern end of the reef into the South pass for a distance of nearly $1\frac{1}{2}$ cables. There are the remains of a wrecked sailing vessel on the reef.

The *green* sector of Hastie point light shows over the Great reef and its off-lying dangers, and the northern limit of Tanio point light southern *white* sector just touches the southern extreme of the shoal water off the southern end of Great reef.

The best guides to the South pass or principal entrance are the reefs themselves, as the heavy breakers on their edges unmistakably mark the form of both reefs.

The Little reef commencing about 6 cables from the northern end of the Great reef extends about 6 cables farther in a north-easterly direction; it does not uncover, but has very little water over it at parts and breaks heavily. There are from $3\frac{1}{4}$ to 8 fathoms between the two reefs, but vessels should avoid that passage on account of the absence of leading marks, the uncertainty of the current, and the roughness of the sea.

A *red* sector of Tanio point light shows over the Little reef.

Tanio shoal.—**Buoy.**—This shoal surrounds the point and extends in an E.N.E. direction 4 cables from it, or halfway across the North channel, with only from $2\frac{1}{2}$ to 3 fathoms water, and the sea does not always break on it. Being mainly of sand, both form and position are liable to change when rollers set in, as they frequently do in the hot season. A red conical buoy lies in 5 fathoms at the eastern extreme of the shoal.

A *red* sector of Hastie point light shows over Tanio shoal.

Hastie point is encircled by a reef which dries out 4 cables on

General charts 759b, 2899, 597, 748a.

Plan 688, Tomatave. Var. 8° 40' W.

the northern and north-eastern sides, and $2\frac{1}{2}$ cables towards the South-east and South. Off the eastern side are patches of less than 5 fathoms nearly $2\frac{1}{2}$ cables from the edge of the reef; and at the northern end, a bank of coral and sand continues a cable farther, with only $2\frac{3}{4}$ fathoms over it; the sea does not always break on this part.

Caution is necessary in clearing Hastie point reef when entering or leaving, for there is reason to believe that the visitation of a cyclone or even a heavy gale sometimes causes a temporary accumulation of sand around the reef, stretching westward into the roadstead. The effect of the tide has also to be guarded against, for, on the ebb, the stream runs strongly to the southward, and vessels in attempting to pass too close have been wrecked on this bank.

Buoy.—A black conical buoy, with a cylindrical topmark, is moored in a depth of 5 fathoms at the northern end of Hastie point reef; it also shows a *red fixed* light when any vessel has to leave the port at night; the captain must make application for its exhibition at the harbour office the day before.

South reef (*Lat. 18° 10' S., Long. 49° 26' E.*).—From 5 cables and extending to more than a mile south-westward of Hastie point is a reef with only 10 feet over it. During the N.E. monsoon there is smoother water between the South reef and the shore on that side of Hastie point than on the northern side.

DIRECTIONS.—North Pass.—Vessels from the northward intending to take this passage should hug the coast from abreast Foule point, so as to avoid the Ifontsy and Marie Eugénie shoals (*see* pages 282, 283), and pass midway between Prune island and the coast. Rangazava bank, with a least depth of $5\frac{1}{4}$ fathoms, is in the fairway, and should be avoided by deep draught vessels when there is any swell. The broad space between Prune island and the shore affords the largest entrance channel, where from 11 to 17 fathoms will be found, with either the red-roofed building or the lighthouse on Tanio point bearing from S.S.W. to S.S.W. $\frac{1}{2}$ W., until close enough to see Hastie point; and when Hastie point lighthouse bears S. by W. westerly, steer direct for it, running down between the Great reef and Tanio point shoal, and anchoring as desired in either the northern or southern anchorage.

The western side of the Great reef is at all times visible, but there are some detached patches; the reef off Tanio point cannot be seen, but is marked by a red conical buoy as before described.

By night, keep in the inner *white* sector of Tanio point light until the *white* sector of Hastie point light is distinctly made out, when run for it, bearing S. by W. westerly, for the anchorage.

NOTE.—The *white* sector of Tanio point light leads over Rangazava bank.

General charts 759b, 2899, 597, 748a.

ANCHORAGE.

Plan 688, Tamatave. Var. $8^{\circ} 40'$ W.

East pass (*Lat. $18^{\circ} 6'$ S., Long. $49^{\circ} 29'$ E.*).—This pass is between the Three-fathom reef and the Little reef, and the depth may vary from 17 to 8 or 9 fathoms. For vessels from the northward passing outside Prune island, the course through is N. 81° W. with the Salazamay beacons in line (*see page 286*) until Hastie point lighthouse bears S. by W. westerly, when the latter should be steered for and anchorage taken up as desired.

By night, steer in from the north-eastward with Tanio point light bearing S.W. westerly, keeping in its narrow *white* sector, until in Hastie point light *white* sector, bearing S. by W. westerly, and then proceed for the anchorage as by the North passage.

South pass.—This, the principal channel, lies between the Great reef and Hastie point reef, and has a clear width of 2 cables, with a depth of from 16 to 5 fathoms, muddy bottom, but care should be taken not to approach too close to the southern end of Great reef on account of the sandspit off it. The detached $3\frac{3}{4}$ -fathoms coral patch, 2 cables south-eastward from the southern end of the Great reef, does not alter the direction of the passage. Vessels arriving from the southward should bring the beacon on Tanio point on with the lighthouse bearing N. 38° W. and run for it, passing northward of the black conical buoy. The eye is a good guide through the pass, and when the Governor-General's flagstaff in the port bears W. by S. $\frac{1}{2}$ S. it may be approached on that line and anchorage taken up as convenient with regard to other vessels sure to be found there, probably crowding into the south-eastern corner behind Hastie point reef.

If going to the northern anchorage, steer for Tanio point as before until Hastie point lighthouse bears S. by W. westerly, when, keeping it on that bearing, steer the opposite course for the anchorage between Tanio point and the Great reef.

By night.—Steer in as before towards Tanio point and keep the main light and beacon light in line N. 38° W., when a vessel will be within the narrow *white* sector of the main light; if too far to the northward that light will show *green* and if too far southward, *red*; great caution is necessary not to get outside the northern limit of the *white* sector as it just touches the south extreme of the shoal water southward of Great reef. Hastie point light will show *red* in approaching, and turn to *green* when in the Pass, to *white* when through the Pass, and to *red* again immediately after, unless a vessel is going on to Tanio road; in which case she should keep in the *white* sector of Hastie point light, bearing S. by W. westerly, and run on up to that road, anchoring when Tanio point light bears about West.

Anchorage.—A good berth off the town is in line between the two lighthouses, with the northern end of Hastie point reef about

General charts 759b, 2899, 597, 748a.

Plan 688, Tamatave. Var. 8° 40' W.

S.E. by E. $\frac{1}{2}$ E., in 9 or 10 fathoms, or a cable farther south and nearer to Hastie point reef in a similar depth, but in neither berth is the holding ground good. The space is also small, therefore mooring is necessary; open hawse S.S.E. Here a vessel is exposed to wind and sea from the North, and the swell setting in between the reefs at other times causes vessels to roll heavily; therefore, if not taking in or discharging cargo, vessels will find better and more roomy anchorage with smoother water in Tanio road, between Tanio point and the Great reef, especially abreast of the bight in the latter. Here there is excellent anchorage with good holding ground in from 13 to $9\frac{1}{2}$ fathoms, soft mud, with Tanio point bearing about West.

The only objection to this anchorage is, that on their way to the town, boats must cross the entrance, where there is nearly always a heavy sea.

Mooring buoy (*Lat. 18° 8' S., Long. 49° 27' E.*).—Man-of-war moorings are laid in the northern anchorage; the buoy marking the moorings is situated E. by N. a distance of $5\frac{1}{2}$ cables from Tanio point lighthouse.

Steam tugs.—Seven steam tugs are available; the proper signal for a vessel to make, if the services of one is required, is to hoist the pilot flag under the national flag. The tugs are the property of the Société du Wharf de Tamatave.

Jetties.—A metal jetty runs out perpendicular to the coast on the northern side of the town; it is about 300 yards long with a T head, 170 feet wide, and lying in 19 feet of water. It is fitted with all appliances for landing and discharging cargo.

A wooden jetty 60 feet long is situated on the small point southward of Amiot head; there are landing steps and a crane and 3 feet of water; alongside this jetty a current is nearly always setting to the southward inside the reef, and when the rollers are setting in it attains a rate of 3 knots an hour.

Landing place.—There is good landing for boats at the wooden jetty inside Amiot head, before described. It is the only part where the sea does not break. Amiot head beacon marks the edge of the reef round which boats pass to reach the landing, and off which the current runs strongly.

Rifle range.—A rifle range has been established at the Lazaret; this range will, except for any special reason, only be used in the morning; it will also be used on every holiday except on Fridays. Half an hour before firing takes place a red flag will be hoisted, and "the retreat" sounded on the bugle; on the conclusion of practice the red flag will be hauled down. Firing will be suspended every hour for 10 minutes, and also when a vessel or a boat is seen to be within the danger zone, viz., in a space comprised within about 3,300 yards in the rear of, 500 yards to the left of, and 350 yards to the right of the targets.

Plan 688, Tamatave. Var. 8° 40' W.

Supplies.—There is a very small quantity of coal kept, and what there is is not for sale. Meat and bread are plentiful and vegetables from May to November. Distilled water may be procured in a tank.

Tides.—It is high water, full and change, at Tamatave, at 1h. 58m.; springs rise 3 feet, neaps 2½ feet.

Quarantine regulations.—All vessels visiting the port must be provided with a bill of health, and on entering the harbour must fly the quarantine flag and keep it flying until permission has been given to haul it down. The medical officer will visit mail steamers any time they may arrive; other vessels between 6 a.m. and 6 p.m. immediately after anchoring.

Vessels from India and Mauritius with a clean bill of health, and having had no infectious diseases during the voyage, will be allowed to land passengers. In the case of an unclean bill of health or suspicious cases during the voyage, the vessel will be placed in quarantine for 5 days, and the whole cargo and vessel will be disinfected. In the case of vessels coming from plague-suspected places only the cargo taken in at those places is disinfected, and the cargo which cannot be disinfected must not be discharged.

Prune island (*Lat. 18° 3' S., Long. 49° 30' E.*) is the quarantine station, where there is accommodation for 150 people and a disinfecting apparatus.

A certificate of health is given before vessels leave on production of Custom house receipts, &c.

Chart 759b, Antongil bay to Ambatosoa.

COAST.—Southward of Tamatave, as before stated, the coast assumes nearly a straight line as far as Ytapére point, a distance of about 429 miles. It is generally low and covered with trees, the nearest ridge of hills being 15 miles inland; in the first 220 miles there lies between the higher land and the seashore a succession of lakes and lagoons, receiving numerous streams, and fronted by a barrier of sand generally about 3 miles wide, thrown up by the sea under the prevailing south-easterly winds. The old pathway leading from Tamatave to the capital passed along this sandbank as far as Andovoranto, about 50 miles, before turning inland, goods being carried thus far in canoes, but from thence to the capital on men's shoulders, about 6,000 porters per month arriving at the capital, and the journey occupying on an average ten days. The new road from Tamatave, with its wheeled traffic, gave this method its death-blow, and the completion of the railway and canal must cause its entire cessation.

A canal named Pangalana connects Ivondrona, the terminus of the steam tramways from Tamatave, with Andovoranto and Brickaville; there is a least depth in the several cuttings of from 5 to 5½ feet,

General charts 2899, 597, 748a.

Chart 759b, Antongil bay to Ambatosoa. Var. 8° 50' W.

and a service of steam launches of from 30 to 150 horse-power runs twice a week each way.

Between Tamatave and St. Lucia bay, a distance of 413 miles, the coast affords no shelter for vessels; those obliged to visit it are compelled either to anchor insecurely in the open, or to carry on their traffic under way. Certain points, such as Mananzari and Matitanana, are, notwithstanding these difficulties, visited by merchant vessels, both sailing vessels and steamers.

River Ivondrona or Ivondro.—At 6 miles from Hastie point is the entrance to the lagoon into which the Ivondrona flows; it is obstructed by a sand bar extending a cable off-shore, but inside it is navigable by boats for some miles. The water from a fine cataract flows into the river. There are also two immense caverns in this district. A rock, with 12 feet over it, is reported to lie about one mile off the mouth of the river; the *Hugon*, however, never succeeded in finding it. The village Zolokefa is on the left bank of the river; it has about 900 inhabitants and an English chapel, but the situation is low and unhealthy.

Nosi Faho is $7\frac{1}{2}$ miles S. by W. $\frac{1}{2}$ W. from Hastie point, $2\frac{1}{2}$ miles off-shore, and $1\frac{1}{2}$ miles in length N.E. by N. and S.W. by S.; it is a very low sandy islet without a trace of vegetation, and is surrounded by a coral reef, awash, steep-to, and always breaking; a depth of $7\frac{1}{2}$ fathoms was found at 3 cables from the northern side, and 16 fathoms at a mile, but the *Hugon* reports that it may be passed pretty close to on all sides.

Nosi Dombala (*Lat. 18° 27' S., Long. 49° 25' E.*).—At $7\frac{1}{2}$ miles S.S.W. from Nosi Faho, and $3\frac{1}{2}$ miles off-shore, is Nosi Dombala, about 330 yards in length and breadth; it is low, consists of coral and sand, is covered irregularly with bushes, highest at the southern end, and may be seen 10 miles distant. It cannot be mistaken for Prune island, 22 miles to the northward, that island being covered with high trees. Landing may be effected in fine weather by small boats on the north-western side, and there is anchorage on that side in 10 fathoms, sand. On its eastern side, the coral reef, which encircles the whole island, appears to extend 7 or 8 cables; the reef is mostly awash, and the sea breaks over the whole; it is steep-to and may be approached fairly near with safety.

In the direction of Nosi Faho, a shoal bank of coral extends from this reef nearly two-thirds of the distance, with apparently depths of 5 fathoms; this bank is clearly marked by daylight by the discoloured water over it. A rock with less than 6 feet over it, but which seldom breaks, lies about 2 miles northward of Nosi Dombala. Vessels should on no account pass between Nosi Faho and Nosi Dombala.

General charts 2899, 597, 7/8a.

Chart 759b, Antongil bay to Ambatosoa. Var. 9° W.

Nosi Fonga, about 5 cables South of Nosi Dombala, is a sandy islet about 7 cables long North and South, and surrounded by a coral reef. At a distance it looks like a sail, there being only a single clump of trees on it. The encircling reef is steep-to; on the sea side, at one mile out, there is no bottom with 20 fathoms; towards the shore there are from 15 to 18 fathoms.

Between the two last-named islands there is a narrow passage, which, however, no vessel should attempt, even during the finest weather.

Anchorage.—The *Hugon* found good anchorage with smooth water westward and under the lee of these islets and reefs, and reported the whole passage down the coast westward or in-shore of them to be perfectly safe and clear.

Bank.—H.M.S. *Tourmaline*, in 1884, struck soundings in 6 fathoms, in lat. $18^{\circ} 44'$ S., on a bank about 6 miles off-shore, and 8 miles E. by S. from Vavoni village.

Rivers.—There are several small and unimportant barred rivers between the Ivondrona and Andovoranto, where is the next opening of any importance, some 45 miles farther southward.

Andovoranto is a large village on the northern side at the mouth of the river Jark or Iharoka, about 50 miles southward of Tamatave. It is the capital of the province of Andovoranto, which had a population, in 1910, of 79,128, of whom 293 were Europeans and 157 Asiatics or Africans. Andovoranto, which is above all a point of transit, has lost some of its commercial importance, as the goods for Antananarivo, which formerly were landed here, are now landed at Tamatave, on account of the bar here being so often dangerous, and cannot be crossed by ships' boats even in fine weather. The province, however, still has a considerable export trade, including rafia, hides, rubber, wax, and cassava. The steamers of the Havro Peninsula Company call here on their way to Réunion and Mauritius, and there is telegraphic communication with other places. In 1910, 29 vessels entered the port, with a total tonnage of 59,810 tons. The total value of imports was £59,479, and exports £38,467. The Pangalana canal connects Andovoranto and Brickaville with Ivondrona by a steam launch service. Tanimandri fort stands to the southward of Andovoranto on the opposite side of the river.

Brickaville, the present terminus of the railway from Antananarivo, lies about 12 miles from Andovoranto.

Light (Lat. $18^{\circ} 57'$ S., Long. $49^{\circ} 8'$ E.).—On the northern point of entrance to River Jark, at an elevation of 29 feet above high water, is exhibited a *fixed white* light, visible in clear weather from a distance of 5 miles.

In 1884, the *Boursaint* anchored in $8\frac{3}{4}$ fathoms, grey sand, the church bearing N. $\frac{3}{4}$ W. and the southern point of the river's mouth in line with a small wooded hill, which has two white patches near the summit, N.W. $\frac{1}{4}$ N.

Chart 7596, Antongil bay to Ambatosoa. Var. 9° W.

Coast.—Southward of Andovoranto as far as Vatomandri, about 22 miles, the coastline is nearly straight. A channel communicating with one of the lakes running parallel with the shore falls into the sea in about lat. 19° 5' S. On the southern side of that opening is the large village Alalava, half hidden by the trees which border the coast. Among the hills near the coast, southward of Alalava, a white patch, like a long road descending towards the sea, may be seen at a distance of 8 miles, especially from the southward. At 6 or 7 miles southward of Alalava, and 8 miles northward of Vatomandri, a short distance from the shore, is a remarkable black rock or islet, which, when bearing W. $\frac{1}{2}$ N., is in line with Vatomandri saddle.

Vatomandri saddle, the northern summit of the nearest ridge of hills, rises about 2,000 feet above the sea; when seen from the North, it presents the appearance of table land, and from the East or South, that of a saddle; it is about 12 miles inland, and is an excellent landmark.

Plan of Vatomandri on 1036.

VATOMANDRI is at the mouth of a river of the same name; under the former régime, it was the residence of a chief under the governor of Tamatave; it is now the capital of the province of Vatomandri. The village is visible about 6 miles. The Hova village, with a flagstaff in the middle of it, is near the sea and northward of the European houses, some of which have red roofs; in the middle of the group is a two-storied red-roofed house, higher than the others and a conspicuous object.

Vatomandri, next to Tamatave, is (or was) the chief port of entry for textiles destined for the interior, having the advantage of a route to Antananarivo, by which they were conveyed at three-fifths the charge from Tamatave.

The province is very rich in natural products, rafia, rubber, wax, gum copal, rice, vanilla, and coffee; gold is also found. Unfortunately it has been devastated in many years by floods, cyclones, and locusts, so that the imports and exports show a general falling off. There are large numbers of cattle, nearly 30,000 head.

The population of Vatomandri in 1910 was estimated at from 2,500 to 3,000. In the same year the province had a population of 128,188, of whom 301 were Europeans, and 90 Asiatics or Africans; there were then 40 European farmers in the province.

In 1910 the total value of imports was £12,486, and exports £33,886; 43 vessels entered the port, with a total tonnage of 75,389 tons.

The Black rocks (Lat. 19° 18' S., Long. 49° 3' E.), off the entrance to the river, are good guides to the anchorage; the northern Black rock is 20 feet high, and much higher than the others; it is of conical form, and makes a good landmark. The sea always breaks on

General charts 2899, 597, 748a.

Plan of Vatomandri on 1036. Var. 9° 10' W.

a reef from 2 to 4 cables eastward of the Black rocks, and again on the two Outer reefs, which are awash and upwards of a mile E.S.E. from the Black rocks, with deep water at a short distance around them.

Shoals.—The French ship of war, *Bisson*, when standing in for the anchorage off Vatomandri, found $5\frac{1}{2}$ fathoms at a mile northward of the Outer reefs, and on another occasion sounded in $8\frac{1}{4}$ fathoms near the same spot, with the Black rocks bearing W. by S. The *Hugon* examined this shoal, and found it to consist of a plateau with from $4\frac{3}{4}$ to $8\frac{1}{2}$ fathoms over it, $3\frac{1}{2}$ cables in extent East and West, by from $2\frac{1}{4}$ to $2\frac{3}{4}$ cables North and South. It is steep-to on the land side, but sloping towards the sea. There is plenty of water between the Outer rocks and this shoal. The two-storied red-roofed house bears about West from its centre; half a point on either side of this bearing marks about the limits of the shoal.

Two shoals, the depth on which is not stated, are reported to exist, one at a distance of $1\frac{3}{10}$ miles N. 73° E. from the northern Black rock, the other at a distance of 2 miles S. 12° E. from the northern Black rock.

An isolated rock (*Lat. $19^\circ 18' S.$, Long. $49^\circ 3' E.$*), with $3\frac{3}{4}$ fathoms over it, and on which the s.s. *Ile de la Réunion* touched, lies S. by E. $\frac{1}{2}$ E. a distance of about $3\frac{1}{2}$ miles from the Outer reefs, but its exact position is doubtful.

Other reefs have also been reported to exist extending from 2 to 5 miles south-eastward of the Outer reefs.

Chart 759b and plan 1036.

Directions.—Either anchoring in or quitting Vatomandri road is always easy, if entering from the northward during north-easterly winds and leaving by the passage to the southward. A sailing vessel from the northward or north-eastward should bring Vatomandri saddle to bear about W. by S., and by the time soundings are obtainable with the hand lead, the Black rock, mentioned at page 294, as lying 8 miles northward of Vatomandri, will be seen. A course may then be steered for the anchorage, bringing the northern Black rock off the river's mouth to bear S.W. $\frac{1}{2}$ S., and anchoring as recommended. Sailing vessels should always allow for a probable set to the southward, perhaps as much as a mile an hour.

A sailing vessel from the southward should bring Vatomandri saddle to bear N.W. by N. and run for it on that bearing; before getting on the bank of soundings the red-roofed house will be seen and the Black rocks off the river. She should then haul in towards the shore to avoid the reefs said to exist south-eastward of Vatomandri, and approach the anchorage westward of the outer reefs, keeping rather nearer them than the Black rocks until the northern Black rock bears about W. by N. when the anchorage may be steered for direct.

General charts 759b, 2899, 597, 748a.

Chart 759b, and plan 1036. Var. 9° 10' W.

Anchorage.—Vessels may anchor about N.E. $\frac{1}{2}$ N. from 4 to 8 cables from the northern Black rock in from 8 to 10 fathoms. At $3\frac{1}{2}$ cables from the rock, on this bearing, the southern side of the western Outer reef, awash, was on with the northern side of the eastern reef S.E. $\frac{1}{4}$ E., which shows that they are inaccurately placed on the chart. The holding ground is fairly good, the bottom being generally mud and fine sand, with a few scattered patches of coral, but the sea is always high, and as the south-going current is generally strong in the road, vessels swing broadside to the swell, causing a disagreeable roll, especially with easterly winds.

The current in the offing is variable and strong, sometimes setting to the North, but more frequently to the South.

Plan of Vatomandri on 1036.

River (*Lat. 19° 18' S., Long. 49° 2' E.*).—**Landing.**—The bar occasionally changes, and is often impassable, even for the large-decked bar boats used in the country, and is nearly always closed against ships' boats, which should never attempt a landing; if landing is practicable, it may always be effected by making a signal for one of the native craft, by International code, but all communication with the shore is frequently interrupted.

Tides.—It is high water, full and change, at Vatomandri, at 4h. 20m. Springs rise $7\frac{3}{4}$ feet.

Supplies.—Cattle, rice, pigs, poultry, and potatoes are plentiful, but no coal.

Communication.—Local communication is by means of coasting vessels, canoes on lakes and rivers, and overland by numerous roads and paths which are quite safe for horses or mules. The French coasting steamer calls twice a month. The Havre Peninsula Company's steamer once a month, and a German steamer thrice yearly. Vatomandri is also in telegraphic communication with the capital.

Compass.—**Local magnetic disturbance.**—At Vatomandri anchorage, the variation was found to be 4° less than the magnetic curve passing that place, and 6° less than that observed at Mahanoro.

Chart 759b, Antongil bay to Ambatosoa.

COAST.—From Vatomandri southward to the River Mangoro, the straight coastline is low and bordered by trees, interrupted by the mouths of the Rivers Mitinandri and Manandri. The latter may be known by the village of Marosika and a small cluster of cocoanut trees standing separately, and from thence a row of trees, principally filaos, is continuous as far as Mahanoro.

On the second ridge, a short distance inland, are small hills, and three of them are good landmarks. One on the southern side of the

General charts 759b, 2899, 597, 748a.

MAHANORO.

Chart 759b, Antongil bay to Ambatosoa. Var. 9° 30' W.

River Sakalina, about 14 miles inland, is flat, slightly inclined to the South, with a large rounded base. The second, Round hill, is about 6 miles inland, conical and of a dark colour; when running along the coast from the southward, it is seen to the left of Mahanoro point. The third, farther South and much farther inland, is the Betsizaraina saddle, of which the summit, 1,760 feet above the sea, is slightly hollowed at the centre. When seen from northward of Mahanoro, its profile appears against the sky behind the hills of the second ridge; but from the southward, it shows a dark outline against a background of distant mountains.

Vaudreuil bank (Lat. 19° 30' S., Long. 49° 1' E.) is of coral, and was examined by the French vessel of war of that name. The length is $1\frac{1}{2}$ miles, North and South, and the width 3 or 4 cables within the 5-fathoms line; it lies parallel with the shore, from which it is separated by a safe channel one mile wide. The least water found over it was $2\frac{3}{4}$ fathoms.

A $4\frac{1}{2}$ -fathoms bank is shown on the chart as lying about $7\frac{1}{2}$ miles north-eastward of Mahanoro, and another at 3 miles in the same direction; the latter was searched for by Lieut. Hockin, of H.M.S. *Marathon*, in September, 1895, and regular soundings of $7\frac{1}{2}$ fathoms found at the spot indicated. Capt. Denis, of the *Hugon*, states that no such shoals exist, and that, with the exception of the Vaudreuil bank, the whole coast from Vatomandri to Mahanoro is absolutely safe and clean, and may be coasted along close-to, passing, if necessary, inside the Vaudreuil bank, though it is best to pass outside.

Plan of Mahanoro on 1036.

MAHANORO, in the province of Vatomandri, with an estimated population of 3,000, stands about 38 miles southward of Vatomandri, on the eastern side of a river which flows from a broad expanse of shallow lagoon, one of those found almost everywhere in this vicinity just inside the coastline.

The Hova village and a palisaded fort stand on a peninsula covered with trees, of which the western end is about 130 feet high, the eastern end sloping down to the sea. When seen from North-east or South-east, it has the appearance of an island; when seen from the eastward, in consequence of being darker, it stands out distinctly from the high land behind it. The European settlement is on the western or opposite side of the river entrance.

Communication.—The French coasting steamer calls once a month outward bound from Tamatave, and once every two months returning, and there is telegraphic communication with the capital through Vatomandri and Andovoranto.

River.—Immediately under the western or steep side of the hill,

General charts 597, 748a.

Plan of Mahanoro on 1036. Var. 9° 50' W.

the river discharges over a bar, which nothing larger than surf boats can pass; the rush of water and north-easterly gales cause the bar to shift, and it has to be dug out from time to time. It is seldom passable by ships' boats, but surf boats can generally be obtained by signalling with the International code.

A heavy sea from the south-eastward sets in through the anchorage, and is so heavy in June and July that communication with the shore is often interrupted for several days consecutively.

Reefs.—A chain of reefs extends from the eastern side of the peninsula about $2\frac{1}{2}$ miles N.E. by N.; the sea breaks continuously, even in fine weather, for about $1\frac{1}{4}$ miles, and on the shoaler patches beyond that, but is not often seen to break for more than the first 2 miles. Caution must therefore be observed when passing them, as well as the positions of the supposed dangers still farther north-eastward.

Anchorage (*Lat. 19° 53' S., Long. 48° 52' E.*).—The only anchorage is westward of the reef, where there is some little shelter and less rolling than at Vatomandri. Entering from the northward, it is best to coast along inside all reported reefs; and if from the southward, having rounded the northern end of the reefs, in either case bring the flagstaff on the highest part of the peninsula to bear about S.W. by S. and steer direct for it until a single tree of remarkable appearance, at the edge of the beach, about one mile northward of the fort, bears about W.S.W.; then anchor in from 6 to $4\frac{1}{2}$ fathoms, sand, or sand and mud, fairly good holding ground. The water shoals very gradually from 7 fathoms.

Should the single tree disappear, as it may at any time, the anchorage may be approached carefully by the lead on the bearing of the flagstaff above given, and the anchor dropped in a prudent depth.

Supplies, &c.—Beef, pork, rice, and cassava can be procured, and sometimes a few other vegetables. Rice is plentiful and said to be of better quality than elsewhere in Madagascar; it is sent off in small handy palm-leaf bags.

Small quantities of hides, wax, rubber, and coffee are exported; cotton goods and hardware, principally iron pots, are imported, but the trade is insignificant.

The climate about Mahanoro is bad; fever attacking everyone on shore, and sometimes even on board ship.

Chart 759b, Antongil bay to Ambatosoa.

THE COMPASS.—Local magnetic disturbance.—Near and northward of Mahanoro, it has been reported that some

General charts 597, 748a.

Chart 759b, Antongil bay to Ambatosoa. Var. 10° 20' W.

local influence deflects the magnetic needle; after rounding the reef for the anchorage, the westerly variation appeared to be more by 3° or 4° than in the offing. It is not certain that this perturbation of the needle is constant, but it is desirable that information should be obtained and observations made when possible.

Current.—The average set in the offing between Tamatave and Mahanoro is about $1\frac{1}{2}$ knots S.S.W., *i.e.*, following the direction of the coast. A passage is, therefore, easily made from North to South, and the wind generally blows off-shore at night.

River Mangoro or Onibe (*Lat. 19° 58' S., Long. 48° 50' E.*), the largest river on the East coast of Madagascar, falls into the sea 5 miles southward of Mahanoro; it receives the streams from many mountain gorges and forms a succession of cataracts and rapids even down to the mouth, where there are rocks and breakers apparently extending completely across, though Capt. Denis, of the *Hugon*, was of opinion that there might be a narrow passage on the southern side of the entrance accessible to small coasting vessels.

Fort Betsizaraina is on the left bank, $3\frac{1}{4}$ miles up the river. A beautiful wood, called *mango wood*, resembling mahogany and excellent for cabinet work, is found on the banks of this river, and is unknown elsewhere on the island.

The muddy waters of the Mangoro sometimes extend a long way to sea, and by their colour present so strong a contrast to the sea proper, as might cause alarm from apprehension of shoal water. There is, however, nothing to fear, the depth being great.

Coast.—Southward of Mahanoro, the coast is very low and bordered with trees, among which casuarinas are predominant. This ridge of trees continues without interruption for 14 or 15 miles, but a chain of small hills, slightly wooded, rises almost immediately behind them, and the land beyond is in hummocks. The trees then disappear for a space of 3 miles, leaving in sight a lightly-wooded plain; in that space, the Rivers Sahantsio and Masura discharge; a narrow branch of the Lohotra, a small stream to the northward, runs close along inside the beach and unites with them. From this vicinity, Betsizaraina saddle commences to be undistinguishable from the mountains in the background.

At 2 miles farther southward, *i.e.*, in about lat. 20° 18' S., a vessel was wrecked many years ago, and, as late as 1896, her remains were still to be seen from a considerable distance, the white sandy beach causing them to show very distinctly. From thence, the sea coast is

General charts 597, 748a.

Chart 759b, Antongil bay to Ambatosoa. Var. 10° 40' W.

again thickly bordered by trees, and for a space of 4 miles a small chain of hills, close to each other, shows above the trees. From thence nothing can be seen for some distance but the belt of trees along the coast and hills of moderate height lying in ridges North and South behind them. In lat. 20° 34' S., there is a remarkable Sugar-loaf hill, slightly inclined towards the South; it is visible at a great distance, easy of recognition, and a good landmark, but the *Hugon* reports that, though represented in the chart as close to the coast, it is in reality 7 or 8 miles inland. From this part, the hills diminish in height towards lat. 20° 42' S., where a summit of no great height presents north-eastward and south-eastward the appearance of three teeth of a saw; viewed from an easterly direction it is an undefined mass.

About the same latitude, vegetation near the coast becomes less vigorous, trees being gradually replaced by bushes, and nearly disappearing towards the mouth of the River Fanantara, which is otherwise as little remarkable as the entrances to other streams South of the Mangoro.

Sakaleoni (Lat. 20° 34' S., Long. 48° 36' E.).—At about 37 miles southward of the Mangoro is the mouth of the River Sakaleoni; on the northern side of the entrance is the village of Sakalea, and a little to the southward of the South side the village of Nosi-Varika. The position of the entrance may be generally discovered by the conspicuous Sugar-loaf hill, but when it is covered with mist or rain the entrance is very difficult to distinguish.

Anchorage may be obtained, but the holding ground is indifferent, off the entrance to the river in 17 fathoms fine red sand, with Sugar-loaf hill in line with the entrance bearing S. 84° W. The depths decrease very slowly and regularly from the anchorage towards the entrance, and 5 fathoms was found just outside the bar about 150 yards from the mouth of the river. Communication with the shore is difficult, except when the sea is smooth.

A branch of the Sakaleoni runs to the southward parallel to the coast, and joins the mouth of the Fanantara 17 miles farther southward. From this river, again, a branch continues along close inside the coastline to the Rangazava lagoon and river, and from thence again by lagoon to within 3 miles of the River Mananjara. On a tongue of sand extending from the right bank of the Fanantara stands the village of Ambohitsara.

Mahela village is on the northern side of the Rangazava lagoon, and, besides the native population, contains several foreigners, representatives of mercantile firms, for there is some little foreign trade

General charts 597, 748a.

GABRIELLE SHOAL.

Chart 759b, Antongil bay to Ambatosoa. Var. 11° W.

at this place. The position may be known by a row of casuarinas 3 miles in length, some on each side of the village; whereas, at Mananzari, 13 miles to the southward, they are to be seen on the northern side only. Southward of Mahela village is a hillock on which there stands, or stood, a very large palm tree; there are also some clusters of cocoanut trees; on a nearer approach, a European house is seen at the southern extreme of the village, having a high roof and two windows on the first floor above the verandah. The old Hova fort with its palisade and flagstaff may also be seen, especially when coming from the northward.

In 1902, the native population around Mahela amounted to between 8,000 and 10,000.

Gabrielle shoal (*Lat. 21° 5' S., Long. 48° 36' E.*).—A bank of coral and sand in the offing with 21 feet over it, and 15 fathoms between it and the anchorage, has been for some time believed to exist, and the schooner *Gabrielle* in 1894 reported she had obtained soundings on it in from 3½ to 8 fathoms, and that it is about 6 miles off-shore between Mahela and Mananzari, but in 1896 the *Hugon* saw nothing of it; its position must, therefore, be considered doubtful.

Directions.—If bound to Mahela from the northward or eastward, make the land about the Sugar-loaf, then coast along in about 10 fathoms until past Ambohitsara village, when a depth of 13 or 14 fathoms should be maintained to the anchorage. The landing place is within the bar, but it should not be attempted by strangers, nor in ships' boats.

Anchorage.—The best berth off Mahela is with the principal house bearing about W. by N. or W.N.W., in 12 or 13 fathoms, sand; except between these bearings the bottom is foul; communication with the settlement is by means of decked surf boats which are to be found here and everywhere along this coast, where European traders have established themselves.

Coast.—Southward of Mahela, after passing a row of casuarinas near it, the coastline is crowned by a border of shrubs and brushwood, above which a small tree rises here and there. At a short distance behind, the land, though not low, shows nothing noticeable. About 3 miles southward of the entry to Rangazava lagoon is another shallow entrance to the inland waters before described; and for 3 or 4 miles northward of the River Mananjara, behind the white sandy beach, the coast is bordered by a dense row of casuarinas, whilst southward of that river there is only brushwood, with here and there small clumps of trees, dark, and ball-like in form.

General charts 597, 748a.

Chart 759b, Antongil bay to Ambatosoa. Var. 11° W.

MANANZARI or **Masindrano** (Lat. $21^{\circ} 10' S.$, Long. $48^{\circ} 27' E.$), about 15 miles southward of Mahela, is built on the high sandy coast on the northern side of the River Mananjara; it is the capital of the province of Mananjari, which province had, in 1909, a population of 87,944, of whom 257 were Europeans or assimilated, and 78 Asiatics or Africans. The population of the town in the same year was 4,500. In the town are some government offices, a number of European business houses, a bank, and an hotel; there is also a military doctor resident there. The traders have stores at Itsiatosika, a fort about 14 miles up the river, as well as at Mananzari; which latter, being at the termination of the Betsiléo road, is one of the busiest places on the eastern coast. There are several flagstaffs in the town; the highest and southernmost is that of the Residency. At 5 miles from the coast, the village is scarcely discernible, but the white sandy beach and a bamboo palisade at the northern end of the town are visible several miles farther. The latter is so regularly built that, from the sea, it looks like a walled esplanade, and is an excellent point of recognition.

River Mananjara.—Reefs.—A chain of reefs, which though not quite awash break almost everywhere, commences southward of the river entrance, and extends 2 or 3 miles north-eastward across the entrance and in front of the whole town, but leaving a passage from the northward into the river between it and the shore, in front of the palisade. This broad opening has a depth of about 12 feet, and is always practicable with south-easterly winds, but difficult, and even dangerous, with northerly winds in proportion to their strength; there is another bar inside the opening and in front of the town, which is sometimes impassable. Inside, the river, with from 10 to 15 feet water, forms a good port, but it rapidly shoals and becomes navigable for canoes only.

Directions.—Vessels bound to Mananzari should make the land about Fanantara river, then follow the coast at a safe distance past Mahela and inside the Gabrielle shoal, hauling in towards the shore until in 9 or 10 fathoms and anchoring as described.

Anchorage.—The depth decreases regularly and slowly in the approach, and the reefs are always clearly visible. The palisade should be steered for, bearing about W. by S., and the anchor may be let go in the open road in front of the northern end of the village, in 8 or 9 fathoms, sand. Steam vessels may also anchor in 7 fathoms in front of the entrance and within $1\frac{1}{4}$ cables of the reef, but large sailing vessels should not anchor in less than 13 fathoms. At this anchorage there is always much swell, causing heavy rolling, especially with the usual south-easterly winds. With north-easterly winds, it is not so bad, but communication with the shore is then more difficult. The closer in a vessel can lie the better for this purpose, as the surf boats will not come to vessels anchored far out.

Landing is easier than at Mahanoro, but should not be attempted

Chart 759, Antongil bay to Ambatosoa. Var. 11° W.

by ships' boats; native canoes manned by 16 hands, and which can load 4 or 5 tons, go off safely.

Communications, Trade, &c.—French steam vessels of the Havre Peninsula Company and Chargeurs Réunis call regularly once a month and sometimes twice, as also do the British Union Castle line. In addition, the French coastal steamers between Diego Suarez and Tulléar call regularly twice a month, and the German Oswald line steamer calls on an average three times a year. Hides, skins, rice, wax, rubber, and straw bags are exported, and cotton goods of all kinds, hardware, pots, crockery, &c., imported; gold is also found in this province. In 1910 the total value of imports was £104,662, and exports £87,906; the number of vessels that entered the port was 122, of a total tonnage of 82,316 tons. The greater part of the exports goes to London, but some goes by the Castle line to Hamburg. Communication with the interior is by canoes through the rivers and lakes; there is a road for light vehicles to Fianarantsoa, a distance of about 121 miles, and another from Fianarantsoa to the capital, a distance of 249 miles.

Fianarantsoa is the capital of the province of that name; it had, in 1910, a population of 7,310; and the whole province 274,652, of whom 281 were Europeans, and 12 Asiatics or Africans.

Mananzari is in telegraphic communication with all the principal places.

Supplies.—Fine cattle can be procured at about £5 a head, but all other provisions are very dear and hard to obtain. Very good drinking water may be got from the river.

COAST.—Southward of Mananzari, the coast is covered with brushwood, with short thick trees showing above it at intervals; the latter disappear entirely after the first 6 or 7 miles. At a short distance inland is a range of small hills, partly wooded, running parallel with the coast; the hills in the interior are not high. At 15 miles southward of Mananzari is Vatasia hill (Mount Ambohitsipanga), 1,050 feet in height, but only remarkable as being somewhat higher and darker than others in this vicinity. This hill is reported to lie about 5 miles S.S.E. from its charted position. Mount Vatovava, which is higher than its neighbour, and dark, lies about 25 miles S.W. $\frac{1}{2}$ W. from the village of Ambohitovo, and about 20 miles inland; it is useful for recognising Mananzari.

The coastline for 22 miles southward of the River Mananjara is a sandy beach, safe of approach; it then becomes rocky, the rocks at first on the shore itself but afterwards slightly detached.

At 25 miles from Mananzari the brushwood bordering the beach is interrupted by a small casuarina wood. A short distance farther South in lat. 21° 39' S. is the mouth of the River Namorona, a little northward of which a rocky spur from the land juts outwards, forming a small cliff, against which the sea breaks heavily; nothing similar

Chart 759b, Antongil bay to Ambatosoa. Var. 11° 30' W.

is to be seen between this and Tamatave. The southern limit of this rocky shore has not been ascertained; but, beyond it, white sandy beach again prevails.

River Faraoni (*Lat. 21° 49' S., Long. 48° 19' E.*).—At 10 miles southward of the Namorona is the River Faraoni, and on its left bank, about 4 miles from the entrance, stands Fort Vatomasima; at its entrance, on the southern side, is the trading village of Ambatozoa. A branch creek runs from this river close inside the coastline to the northward past the Namorona, and communicates with the sea just southward of the Mananjara.

A line of reefs, awash, on which the sea breaks heavily, extends for several miles in front of the Faraoni, through which two channels, with about 16 feet water, lead to an anchorage within the reefs, where there is said to be a depth of 19 feet. These channels are dangerous, except in very fine weather, and are only used by the decked surf boats constructed for the purpose. Outside the reefs there is an open anchorage with indifferent holding ground of sand and coral.

Chart 760, Cape St. Mary to Beavato island, &c.

Coast.—Towards lat. 21° 50' S., the hills are closer together and rise a little higher over a space of 2 or 3 miles. Farther South, a narrow stream, before which breakers extend several hundred yards, cuts the beach abruptly. Vegetation near the coast decreases in proceeding southward towards the wide mouth of the River Itampolo, which flows through a vast plain, in the middle of which is a row of low hills of small extent. At 6 miles farther, a distinct clear gap in the coast, bordered with trees, will be seen, and about 3 miles farther southward is the mouth of the River Mananano, marked by some large casuarinas, and close off the river entrance are some rocks.

Ambatovorona rock lies a little to the southward of the Itampolo lagoon, about 5 cables from the shore.

A short distance behind the entrance to the Mananano is a range of hills covered with trees, which diminish towards the North. At about 7 miles along the coast, some large casuarinas near the coast and breakers some distance out mark the mouth of the River Manakara, and at 10 miles farther southward is the River Mangatseaotra; the entrance to this river is marked by some casuarinas, and by breakers which extend a mile from the shore; in the middle of the breakers, some rocks show above water. Close to the southern side of the river is a village and fort of the same name. A river course or lagoon runs along inside the coastline from Mananano river to the southward.

River Matitanana. — At the mouth of this river is a large estuary which receives the waters from two other streams, in addition to its own torrent during the rainy season, the Anolaka from the North, and the Mainti from the South. The

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. 12° W.

River Matitanana has many rocky rapids and falls; one of the latter makes one plunge of 500 or 600 feet. The coast northward of the entrance is covered with trees; behind are hummocks extending 2 or 3 miles. A small range of hills, generally wooded, come to the mouth of the river. At the foot of these hills is a large village and an English establishment, near a palisaded enclosure. Farther in is a remarkably tall cocoanut tree, its head showing above a cluster of large trees. The right bank is flat; on it are the villages Vatanovo and Monja. Breakers block the mouth of the river and extend half a mile out. At $1\frac{1}{4}$ miles off-shore, there are 13 fathoms.

Within the plain to the westward arises the large isolated hill Ivohilongi; farther back are some small wooded hills, and in the distance a chain of mountains. About 5 or 6 miles inland, on the left bank of the river, are the fort and town of Ambohipeno, one of the principal places in the province of Farafangana.

A great part of the provinces of Mananjari and Farafangana are flat and fertile; rice, sugar, and cattle abound. Ambohipeno has long been the principal settlement of the Arabs on the S.E. coast, which probably accounts for the people being given to divination and fortune telling, also to the preparation of certain medicines and charms. Most of the superstitions of Madagascar have their origin in this province.

Coast.—Matitanana to Farafangana.—The land near the sea is covered with trees. At 4 or 5 miles southward of the River Matitanana (*Lat. 22° 25' S., Long. 48° 6' E.*) is a coral reef connected with the shore; there is then a short break and the Ranambo reef commences, which does not join the land at the northern end, and follows the coast for 7 or 8 miles at a distance of half a mile, leaving a well-protected but narrow harbour inside. The sea breaks over the whole length of the reef, even in fine weather, but there are many openings; those shown on the chart are impracticable for vessels, the sea breaking right across them. There are passages, however, towards each end of the reef; that at the southern end appears to be fit only for the decked surf boats of the country, but that at the northern end appeared to the *Hugon* a good channel, with smooth and deep water within. It was not examined, but it was ascertained that sailing vessels of from 300 to 400 tons do actually use the anchorage inside the reefs, where they lie to embark cattle. At 2 cables outside the reef the depth is about 10 or 11 fathoms.

The Ranambo reef continues alongshore as far as the River Mahitsi; in its southern part, leaving only a space of about 50 yards between it and the shore, and also extending but a short distance off the entrance of that river. Southward of the river, there are still, for some distance, coral patches, but they are all connected with the shore.

General charts 597, 748a.

Chart 760, Cape St. Mary to Beavato island, &c. Var. 12° 10' W.

Southward of the wood, and nearly opposite the centre of the reef, is the large village of Ranambo, near the mouth and on the left bank of a small river, in about lat. 22° 35' S.

Continuing to the southward, the coast again becomes wooded, and, in the interior, the land rises in long elevated plains covered with trees. At 6 miles southward of Ranambo is a large black rock, rising immediately behind the trees on the coast, and the village of Anosi Keli is situated on a bare hill one mile north of the large black rock. The River Mahitsi appears to flow southward of the village.

There is anchorage off Anosi Keli in 8 fathoms on the parallel of the village, but from the anchorage none of the huts are visible; they are shut in by a big clump of trees, some of which are high, and there are three cocoanut palms in it.

Farther South, the coast becomes uneven within the girdle of small trees, over which are seen a series of hillocks, either naked or slightly wooded, until coming to the thick wood which borders the north-eastern side of the River Manambava, of which the entrance is 9 miles southward of the Mahitsi.

Farafangana village (*Lat. 22° 50' S., Long. 48° 0' E.*).—The large estuary, on the southern side of which stands this village, lies about 26 miles south-westward of the entrance to the River Matitanana: it is enclosed by large trees on the northern and western sides, and it forms the mouth of several rivers, including the Manambava, Manampatra, and the Manambato; during heavy rains, the water from these rivers discolours the sea 4 or 5 miles out, and possibly much farther, for discoloured water is reported to have been met with 14 miles south-eastward of Farafangana, and again, in 1897, it was found 12 miles eastward. The bar frequently changes, and always has heavy breakers.

The large village of Farafangana, of which the smaller village of Ambahi forms a suburb, stands on the southern point of the estuary near the sea; a short distance in-shore is another village on the summit of a hill without trees. North of Farafangana, at the mouth of the river and close to the sea, are two conspicuous two-storied European houses with flagstaffs. At the southern end of the village is a house with a reddish roof, and, close to it, an enormous round tree, the only one visible for some distance.

Farafangana is the capital of the province of that name. The population of the province is 241,784, of whom 64 are Europeans and 22 Asiatics.

Anchorage.—Trade.—Vessels anchor off the river entrance, in from 18 to 20 fathoms, muddy sand, and it is not safe to go closer in. The steamer *Ville-de-Riposto*, endeavouring to anchor in 7½ fathoms at 2 miles from the shore, was wrecked in the attempt in January, 1899. The same articles are exported and imported here as at Mananzari; the value of the imports in 1910 was £8,757 and

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. 12° 30' W.

exports £33,205. In 1910, 150 vessels entered the port, of a total tonnage of 45,371 tons. Communication with the shore is by means of decked surf boats and is difficult at all times, and impossible when the estuary is inaccessible. Steamers call regularly, and the port is now of considerable importance. It is in telegraphic communication with Mananzari and Vangaindrano. There is a road for light vehicles to Ivohibe, in the interior, a distance of 94 miles. When the embarkation of passengers is impossible, on account of the bar, passengers are embarked at Anosi Keli.

Temperature.—Rain.—During a period of 3 years the mean annual temperature at Farafangana was 75°, the mean maximum was 82°, and the mean minimum 68°. For the same period the mean annual rainfall was 121·3 inches, which is more than twice as much as fell at Fort Dauphin, only 130 miles to the southward. The wettest months at Farafangana are December to March. *See also Meteorological table in Appendix.*

Coast.—Farafangana to River Mananara.—From Farafangana (*Lat. 22° 50' S., Long. 48° 0' E.*) to the River Mananivo, a distance of about 20 miles, the country is thickly wooded near the sea as well as inland. A large plain lies parallel with the shore, backed at some thousands of yards inland by a series of hills with flat summits of considerable height; the whole covered by dense forest. Lagoons no doubt exist behind the coastline, many openings being seen in the beach and, more conspicuously, in the trees above it.

General remark.—Breakers in this vicinity are said to have been seen some distance from the coast. On this subject, Capt. Denis, of the *Hugon*, reported that, although he had not been able to examine so satisfactorily the coast from Farafangana southward as from that place northward, he considered that where there are rocks and breakers, especially at the mouths of rivers, they do not project so far seaward as the Directions represent or make the approach to the coast difficult, and that they are always to be seen in plenty of time to avoid them. He adds, “When anchorage is desired for commercial purposes, or otherwise, the anchor should not be let go 2½ or 3 miles from the land, but at less than one mile in front of the place with which communication is desired, and still closer if the channel is known, in order to facilitate the work of the decked sloops or surf boats; always bearing in mind the fact of the south-going current.”

The mouth of the River Mananivo has at its entrance a white square mark, with a black disc in the middle, but is difficult to distinguish and may otherwise be known by its separating the forest from a level open country where there are only a few trees; pasture lands and herds of cattle may be seen. There is also a large bank half a mile eastward of the entrance on which the sea breaks heavily.

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Chart 760, Cape St. Mary to Bevato island, &c. Var. 12° 50' W.

A few miles northward of Mananivo is the small village of Iangongo, on the summit of a hillock near the coast, and it is reported that there is anchorage here, for small vessels and a landing, between the breakers and the coast. About halfway between Farafangana and Mananivo is Ankarana hill, some miles inland, with a flat top and perpendicular sides, on which is an old Hova fort.

Anchorage.—When the southern extreme of Ankarana hill bears about N.W. by N., a vessel may anchor opposite the River Mananivo, and 3 miles off-shore, in 18 fathoms, sand, but, as before stated, should come closer in if wishing to communicate. The landing place is in the river, where there is a small village.

At 3 miles northward of the River Mananivo, are reefs parallel with and a mile from the shore, and in the space between, it is reported that vessels of from 20 to 25 tons may find shelter.

The distance between the River Mananivo and the Mananara, to the southward, is 8 miles, during which the ground becomes lower, the trees gradually decrease and vegetation becomes rapidly weaker and thinner. The village Benanoremana may be seen from a distance, as it stands close to the beach northward of the entrance to the Mananara, but clear weather is necessary to see Vangaindrano from the offing, as it is 4 or 5 miles inland from the mouth of the river.

River Mananara (*Lat. 23° 17' S., Long. 47° 51' E.*).—This is a large stream, but the entrance is barred, and the breakers may be seen from a distance; with due caution boats can enter the river in fine weather. The anchorage is off the entrance in from 16 to 18 fathoms, or, if wishing to communicate, as close in as safety will allow, there being no outlying hidden dangers.

The country each side of the Mananara is generally flat and marshy, with extensive and almost impenetrable forests, and is even more liable to fever than most places. A few vessels from Mauritius with merchandise for Vangaindrano call during the course of the year; the imports are mostly either from London or Hamburg.

Coast.—Mananara to River Rengitra.—A small wood covers the entrance point at the southern side of the Mananara, after which the ground rises to a slightly elevated plain and becomes absolutely sterile, with scarcely a small tree or bush on the slope between the coast and the plain; and it thus continues for about 16 miles, until close to the River Masianaka.

The River Vengendrane is a small stream between Mananara and Masianaka; its position may be known by the village of Ekiena, standing conspicuously about one mile to the southward. At this village there is a landing place.

River Masianaka.—The entrance to this river is 16 miles

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. 13° 10' W.

southward of Mananara, and is dangerous. The position may be known by the village of Anositrombi, near its mouth.

Manambondro, about 16 miles south-westward from the River Masianaka, is said to be the best landing place on this part of the coast; it is just southward of the village, where a small creek is sheltered by some rocks. About a mile southward of the creek is the village of Mahabo, where there is a Norwegian mission station.

The coast in this vicinity is wooded and bordered by small hills which rise up immediately behind the coast, and it so continues southward of Manambondro, with here and there rocks extending a short distance seaward. At first the hills are scarcely higher than the coastline, but farther South they become higher and nearer the coast, as does also the chain of mountains in the background. The different river mouths and creeks indicated on the chart can be clearly distinguished.

As far as Ambalafandrana, the hummocks which border the coast are partly denuded of trees and afford pasture land, where herds of cattle may be seen grazing; southward of that point, trees reappear and gradually become thicker; the mouth of the River Sandravina may also be seen.

River Rengitra, or Fotak (*Lat. 24° 4' S., Long. 47° 30' E.*).—The position of this river may be recognised by a group of dark-coloured trees at the inner part of the estuary, and by the summit of one of the high mountains in the interior being in the shape of a bale of goods.

Reef.—A dangerous reef of rocks with a small part above water lies 2 miles off-shore and 1½ miles southward of the northern entrance point to the estuary of the River Rengitra. At 3 miles southward of the rock, which uncovers, and about 2 miles from the shore, there is a breaker, particularly dangerous from its only breaking at intervals, and probably with long periods when it does not break at all. These two dangers are probably united under water, and therefore vessels should not attempt to pass between them.

Coast.—River Rengitra to St. Lucia.—Southward of Rengitra the mountains in the interior lie closer together; between them and the coast are small wooded hills, and in some parts forests of large trees.

The coastline retains a moderate height, less wooded than farther inland and slightly hummocky, becoming nearly arid at the mouth of the River Iavibola. When a little southward of Rengitra, in clear weather, two large abrupt hills will be seen rising from the plain; proceeding southward, they appear to close and touch at the base, and then the remaining space between the two masses resembles an

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. 13° 20' W.

immense embrasure, a little widened towards the top. As a vessel passes southward of the parallel on which they stand the Embrasure first contracts, taking the form of the letter V, and then closes entirely. Nearly at the same time may be seen a little to the right, the Pouce or Thumb, a conical hill about 1,900 feet high, surmounted by an appendage like the knob on the top of a melon glass; advancing southward, especially when South of its parallel, it appears to incline towards the North and becomes finer at the summit, until it somewhat resembles the Thumb of Mauritius. Though the Pouce is 10 miles and the Embrasure $7\frac{1}{2}$ miles inland, they are both some distance in front of the mountains in the interior, and remain visible when the latter are lost in the haze.

There is another landmark in this neighbourhood which cannot be mistaken, should the hills described be hidden by mist. The wooded coast extending from the northward becomes gradually arid towards the South, with hummocks in two places, until the point where it rises in a hill from 100 to 130 feet in height, of which the northern side is a gentle slope and perfectly bare, while the southern side is abrupt and covered with vegetation.

This hill, known to the French as the Tête-mi-pelée, ends in a neck of low wooded land about 2 miles in length, which partially encloses the estuary of the River Manantina, the mouth of which river bears from the Pouce about S.E. $\frac{1}{2}$ S.

The River Ambatobé (*Lat. 24° 23' N., Long. 47° 21' E.*) is 6 miles farther southward; the position of the entrance may be recognised by that of the hills just described. When standing for the anchorage the Pouce should be brought to bear N. by W., and the anchor may be dropped on reaching a depth of 20 fathoms, or closer in if desired (*see General Remark, page 307*). The mouth of the river is enclosed by impassable breakers, but abreast of the anchorage is a good landing place formed by a bend in the coast, and some rocks extending into deep water.

Southward of Ambatobé river, the mountains in the interior are still high, not far inland, and somewhat picturesque. Near the mouth of the Ambatobé, the coast is arid and faced by low cliffs; but farther southward it becomes woody, low, and overlooked at a short distance inland by a ridge of naked hillocks. From 6 miles northward of St. Lucia, two remarkable peaks with flattened summits will be seen, and a little on the right a hill with one side wooded and the other bare. Before arriving at St. Lucia, the six or seven small conical peaks on the Ytapére peninsula will appear like an island, as well as the two small arid hills on the southern side of St. Lucia.

Reefs.—The coast just described is generally bordered by rocks.

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. 13° 40' W.

At 8 or 9 miles from Ambatobé is a large reef 6 miles in length; the most off-lying is from $1\frac{1}{2}$ to 2 miles from the coast. At 6 or 7 miles farther south-westward, and about the same distance north-eastward from St. Lucia, is another reef, detached from the coast, with one part always above water; it extends nearly 2 miles to seaward, and there is said to be a passage between it and the shore.

Plan of St. Lucia bay on 686.

ST. LUCIA BAY (Lat. $24^{\circ} 46'$ S., Long. $47^{\circ} 13'$ E.), called by the natives *Manafifi*, is formed by a curve in the coast and a chain of four principal islands with a number of smaller ones, surrounded by rocks and shoals on which the sea breaks. It is about $1\frac{1}{2}$ miles long, and a mile wide at the entrance, and is capable of accommodating eight or ten moderate-sized vessels; it is the best port on the coast for vessels of moderate draught; the inner part near the town is shallow and obstructed by rocks. The islands are in reality nothing more than flat rocks, very little above water, and often with the sea washing completely over them; at a distance of 3 or 4 miles they are scarcely distinguishable from the low coast and the settlement which they protect.

North-easterly winds blow directly into the bay, but though occasionally strong, they do not raise a heavy sea, but only a moderate swell. During strong southerly winds the sea is smooth in the inner harbour. The holding ground is excellent. During a stay of 15 days at the worst time of the year, when a strong N.E. was blowing, the French gunboat *Scorpion* lay in the inner harbour with her fires out, and communication with the shore was kept up the whole time.

The anchorage is frequented by schooners from Tuléar, who come for cattle.

Shoals.—Depths.—The *Garland* was lost in 1798 on a rock whose position is still doubtful; it is shown on the plan rather more than a mile E. $\frac{1}{4}$ N. from the northern end of Suillac island; but, in 1895, the *Hugon* searched in vain for any trace of the rock. A $2\frac{1}{2}$ -fathoms rock lies N.E. by E. distant $3\frac{1}{2}$ cables from the North point of Suillac, and a similar patch N.N.W. $\frac{1}{2}$ W. distant $3\frac{1}{2}$ cables from the same point. Between Suillac and the shore to the westward and south-westward are several similar and some shoaler patches, all within the 5-fathoms line, and the greater part of the protected anchorage ground has only from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms.

Entrances.—The ordinary entrance is from the northward, but in case of north-easterly winds and current rendering it desirable, a small channel will be found close to the southern end of Chartres island or Nosi Imbune, the second large island from the northward, i.e., between Chartres island and the reef extending 2 cables northward

General charts 597, 748a.

Plan of St. Lucia bay on 686. Var. 13° 40' W.

from Babet island or Anihina, in which channel from $4\frac{1}{2}$ to 6 fathoms will be found.

Between Babet and Chevres islands, the latter also known as Nosi Bé, there is a channel difficult to follow, but fit for small craft drawing 9 feet.

Anchorage (*Lat. 24° 44' S., Long. 47° 13' E.*).—To enter the bay of St. Lucia from the northward, bring the West extreme of Suillac island to bear about S.W. by S., and steer towards it until the nearest part is distant 2 cables, then steer about West 3 cables, and when the south-western end of Suillac bears S.S.E. distant about $5\frac{1}{2}$ cables, a stranger should anchor in $5\frac{1}{2}$ to 6 fathoms, sand, mud, and coral; this clears the outer $2\frac{1}{2}$ -fathoms patches, and vessels should not go farther southward without marks or buoys for the inner shoal patches. The outer anchorage affords very little shelter, but with the inner dangers marked there is excellent well-sheltered anchorage for several vessels of 15 or 18 feet draught.

Landing may be effected at all times in the small bay southward of the town, where there is a jetty.

Supplies may be obtained from the neighbouring villages without having to send to Fort Dauphin.

Water may be obtained either from the River Magnafaf, southward of the bay, or from the River Iramafi, about 3 miles to the northward, but probably with much difficulty in both cases. There are good roads from St. Lucia to Fort Dauphin, to Ranomafana, and to Ambonihazo.

Chart 760, Cape St. Mary to Bevato island, &c.

Coast.—St. Lucia to Fort Dauphin.—From St. Lucia to Itaperina point, a distance of 16 miles, the coast is studded with rocks, some of which are more than 2 miles off-shore but afford no shelter. Halfway between is Mananivo bay, the southern part of which may be known by two hummocks. The Tsiomaro reef lies in the centre of the bay, the outer part extending $2\frac{3}{4}$ miles off-shore, and disconnected rocks, some above water, continue from this reef to the north-eastern point of Mananivo bay; 5 miles inland from the middle of the bay is Mount Ambarabé, 1,992 feet high.

Itaperina (Ytapére) point may be known by six or seven small reddish coloured conical peaks, arid and more pointed but not so high as those to the northward about St. Lucia; the land near the coast, however, becomes higher, and the interior is mountainous. The peak Itapéribé, 528 feet high, bears about N. by W., and is only a short distance from the small peninsula.

General charts 760, 597, 748a.

Chart 760, Cape St. Mary to Beavato island, &c.

LIGHT (Lat. $24^{\circ} 58' S.$, Long. $47^{\circ} 7' E.$).—A white flashing light showing a flash every five seconds, elevated 328 feet above high water, is exhibited from a white cylindrical tower of masonry 23 feet high, on Itaperina or Ytapère point. The flashes are of very short duration. The light is visible in clear weather from a distance of 24 miles. The lighthouse is in telephonic communication with the post office, Fort Dauphin.

Itaperina rocks, on which the sea always breaks, lie about S. by W. distant 8 cables from Itaperina point. The rocks have two heads, about 20 or 30 yards apart, on which the sea breaks unequally; sometimes one will send the foam high into the air, so that it may be seen 5 or 6 miles. From the French vessel *Limier*, in 1885, it was observed to break occasionally on what is probably a separate rock, about one cable eastward of those described. The channel between these rocks and Itaperina point is unsafe, and, in passing outside, a berth of about a mile should be given them.

Plan of Ytapère bay on 686.

Ytapère bay is a very small inlet on the western side of the point having an available depth of from 2 to 3 fathoms, and sheltered by two patches of rocks; it is not more than 2 cables in extent either in width or depth.

Plan of Fort Dauphin on 686.

FORT DAUPHIN, or Faradifai bay, comprises the space between Itaperina point and a small peninsula, 150 feet above the sea, connected with the mainland by an isthmus half a mile wide, together forming an approximation in shape to the letter T. The northern extreme of the peninsula is $5\frac{1}{2}$ miles W. $\frac{1}{2}$ S. from Itaperina point. The shore at the inner part of the bay is of sand lined with rocks.

This is the southernmost port on the eastern side of Madagascar. The French moved here in 1643 from St. Lucia on account of climate. In 1671, it was partially evacuated and the remaining inhabitants massacred. Again a settlement was made in 1768, but was soon after abandoned in consequence of the hostility of the natives and the unhealthiness of the climate. The fort, then constructed on the northern summit of the peninsula which protects the anchorage, is only a semicircular wall, now in ruins, showing, however, somewhat conspicuously at a distance as a white patch, contrasting with the vegetation by which it is surrounded.

For some years the place has been again growing in importance, and this is mainly due to the discovery and cultivation of caoutchouc in the southern region of the island, the country in many parts and quite

General charts 760, 597, 748a.

Plan of Fort Dauphin on 686. Var. 14° W.

adjacent to Fort Dauphin being covered with large forests of india-rubber trees. The native village commences immediately southward of the fort, then follows the European settlement, many of the houses being visible on the top of the hill, but mostly spread round the coast at the head of the bay. Fort Dauphin is the capital of the province of that name; it had, in 1906, a population of about 2,200, and in the same year the population of the province was 180,901, of whom 298 were Europeans and 450 Asiatics or Africans.

Most of the mercantile houses of Tamatave have branches here, and the climate is now stated to be good and healthy.

Rocks.—Two rocky patches of $4\frac{1}{4}$ fathoms are situated respectively $3\frac{1}{2}$ cables N.E. by E. and $6\frac{1}{2}$ cables N. by E. $\frac{1}{4}$ E. from the lighthouse.

Harbour light (*Lat. 25° 2' S., Long. 47° 2' E.*).—A *white fired* light, elevated 115 feet above high water, is exhibited from a white cylindrical metal tower 24 feet high, on the slope of the old enclosure of Flacomb, N.E. of Roava; it is visible in clear weather from a distance of 5 miles.

Directions.—When bound for Fort Dauphin, the land should be sighted about 30 miles northward of the port on account of the strong south-westerly current, which has to be reckoned with, probably from 2 to $2\frac{1}{2}$ knots in the offing, but weaker inshore. If the land is first made from the eastward or south-eastward about Fort Dauphin, the Ytapére peninsula should be recognised by the description just now given, and care should be taken that Cape Ranovalona be not mistaken for it, or the vessel might be run into False Galleon bay. In clear weather such an error would be discovered in time, but in thick weather it might be otherwise. Cape Ranovalona (Ranova) ends in a wooded bluff about 300 feet high, and is conspicuous when making the port either from the eastward or westward; there are some detached rocks a short distance eastward of the point. When heading into the bay, the Residency, a conspicuous red-roofed house, will be seen, and, steered for bearing about S.S.W., it will lead to the anchorage. When approaching the port from the westward the houses first show up when bearing about N. by E.

CAUTION.—Besides keeping to the northward of the point of destination anywhere on this coast, it cannot be too strongly enforced that on approaching the land in quest of an anchorage, a constant and good lookout for sunken dangers should be kept from the masthead, as they can generally be seen at a great distance from aloft by the colour of the water. The transparency of the sea is such that under ordinary circumstances the bottom may be clearly seen in 6 or 7 fathoms, thereby enabling navigable passages to be traced.

General charts 760, 597, 748a.

Plan of Fort Dauphin on 686. Var. 14° W.

Anchorage.—The northern end of the peninsula and the land to the westward form a small bay, in which there is anchorage in from 4 to 4½ fathoms, with the extreme of the point bearing S.E. ½ E.; or vessels drawing 12 feet may go closer in, with the point bearing E. by S. ½ S. In each case they would be about 1½ cables distant from the inner side of the point. As cyclones are unknown here, and north-easterly breezes rarely of any great strength, this is, next to St. Lucia, the best anchorage on the south-eastern coast, and the holding ground is good; though surf sets in during strong south-easterly winds, it is very rare that ships' boats cannot effect a landing. Vessels intending to stay more than a day or two should moor with open hawse to the S.E.

Landing (*Lat. 25° 3' S., Long. 47° 2' E.*).—In the south-eastern angle of the bay, the coast is bordered by rocks attached to the shore the whole distance between the fort and the town. Here, a path will be seen leading up to the plateau of the fort, and at its base are two flat rocks, between which a boat may enter and effect a landing in almost any weather.

Trade, supplies, &c.—The chief export trade is to London, though there is some by the Castle line to Hamburg; the import trade follows principally the same route, the monthly steamer between Diego Suarez and Tulléar calls here twice a month, and there is communication by steam with Durban once in two months; the port is in telegraphic communication with the capital, and therefore with all the principal centres. In 1910 the imports amounted to £23,576, the exports to £75,260; 57 vessels, with a total tonnage of 41,724 tons, entered the port. Of supplies, beef, game, and fish, and land tortoises are plentiful, and rice is abundant; there is no coal. Water for cooking and for the cattle is got from wells in the sand near the landing place, but drinking water has to be procured from some distance inland.

Tides.—It is high water, full and change, at Fort Dauphin at 4h. 30m.; springs rise 4 or 5 feet.

The rainy season.—At Fort Dauphin, during a period of 3 years, the wettest months were January, March, April, June, and October; out of a total mean rainfall of 50·1 inches, 34·6 inches fell during these months. The weather is always changeable, and the winds, though fresh at times, are seldom very strong. *See also page 232.*

False Galleon bay.—This bay, extending westward from Fort Dauphin as far as Cape Ranovalona, is full of coral rocks and shoals, and the sea breaks for a long distance off-shore; but, in one place, in a recess on the south-western side of the peninsula of Fort Dauphin, the water has been observed to be smooth; it is a bay to be carefully avoided by all classes of vessels.

General charts 760, 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. $14^{\circ} 30'$ W.

Coast.—From Fort Dauphin to Cape Andavaka, a distance of 23 miles, the coast is rocky and jagged. The mountains in the interior are very high, and their summits not rounded like the greater part of those to the South-east, but broken, detached sharply from each other, and their sides deeply furrowed by ravines. Within this space of coastline are False Galleon bay, just described; Galleon bay, farther westward; and Andrahomanana cove, just eastward of Cape Andavaka. Close in-shore from the last-named cove is Mount Andrahomanana, 1,400 feet high, showing as a blunt cone of a brownish colour; it is very conspicuous, and the principal landmark on this part of the coast.

Cape Andavaka is high, and makes like an island directly a vessel is clear of Fort Dauphin; beyond that point is a small bay open to S.S.W., the land in the neighbourhood and both points of the bay being very high; from thence, the coast trends first northward, and then westward, forming the bay into which the River Ambolo and Lake Oni flow, the land becoming suddenly low in this bay as the coast trends westward, but rising again gradually to a moderate height and forming a large plain, with no mountains visible in the interior. The coast is more or less wooded, and gradually becomes more wooded in proceeding westward, with some large downs of very white sand; this general appearance continues for about 50 miles, beyond which it is high, rough, and rocky until past Cape St. Mary.

Galleon or Ranofotsi bay (*Lat. $25^{\circ} 9'$ S., Long. $46^{\circ} 45'$ E.*) is about 15 miles W. by S. from Fort Dauphin, between which and it are many creeks, but none affording anchorage. Galleon bay is nearly oval, it recedes $1\frac{1}{2}$ miles and is 2 miles wide; the points forming the entrance leave a passage one mile wide, but in mid-channel is a small coral bank with only 5 feet water, which may be passed on either side; care being taken to avoid the rocks projecting a short distance from the points. In the north-western part of the bay is a black rock resembling a vessel's side; eastward of the rock is a creek or small lagoon.

Anchorage may be found on either side of the bay in not less than 4 fathoms, but the western side is best in fine weather, and that depth will be found closer in than on the eastern side. The latter is best with the wind between East and S.E.; but with strong southeasterly or south-westerly winds, vessels are exposed and very insecure, there being much swell and surf in the bay. The general depth is from 6 to 4 fathoms, mud, with occasional small patches of coral, which latter necessitate care to prevent fouling the cable.

Water may be obtained by digging holes a short distance from the beach.

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island, &c. Var. 14° 30' W.

At 2 miles westward of Galleon bay is a small rocky islet near the coast forms nearly a right angle. The creek runs in $1\frac{1}{2}$ cables, the ward, as far as Andrahomanana cove, about 6 miles from Galleon bay, the coast is fringed by rocks, generally above water, and a short distance in the offing are soundings of from 20 to 44 fathoms.

Andrahomanana cove, or Andrahombé (*Lat. 25° 12' S., Long. 46° 41' E.*).—**Depth.**—This little creek has the form of a horse-shoe, and is on the eastern side of Cape Andavaka, where the coast forms nearly a right angle. The creek runs in $1\frac{1}{2}$ cables, the widest part is over one cable, and it is 130 yards wide at the entrance. The shore at the head is a sandy beach; the remainder, steep rocks almost on a level with the water at high tide, thus forming a natural quay, near which the depth is from $1\frac{1}{2}$ to 3 fathoms. In the middle of the cove there are from $2\frac{3}{4}$ to 5 fathoms; at the entrance 5 to $7\frac{1}{2}$ fathoms. From a few miles at sea the entrance cannot be seen; to do so, a vessel must coast along shore from the eastward, and only small vessels can enter, aided by fine weather and smooth water. Both points being foul, a vessel must keep in mid-channel, and shorten sail or reduce speed as much as possible before dropping anchor in the entrance, directly the western point bears S.S.W., and allowing her to swing without shooting over to the eastern side; she should then be tacked stern foremost towards the inner part of the creek and secured to the shore with four hawsers. A vessel is there sheltered from all winds, but a heavy swell sets in with strong winds from South or S.E., when good hawsers are necessary, especially astern.

To leave the creek, it is necessary to have either a land wind, which is very rare, the use of steam power, or to be towed out by boats during a calm with smooth water.

River Ambolo (Oni).—The high ground on the eastern side of the bight into which this river runs, is bordered by rocks; then it becomes suddenly low and over an extent of 3 miles presents a flat sandy shore, at the western end of which is the River Ambolo, flowing through Lake Oni into the sea. The entrance is nearly barred, and is generally fordable; within the bar, it opens out into Lake Oni, several miles in extent, in which there are, according to native report, 5 or 6 fathoms water. Westward of the river, the ground rises and large mounds of sand are seen, gradually becoming more thickly wooded to the westward, as before described.

River Indrahono, or Mandrere.—The entrance to this river is about 19 miles westward from the River Ambolo, and it is not easily distinguished; near it are some trees more bushy than elsewhere, and also a slight inflection of the coast to the northward, the adjacent

General charts 597, 748a.

Chart 760, Cape St. Mary to Beavato island, &c. Var. $14^{\circ} 40'$ W.

parts, westward, forming a prominent point about 2 miles from the river.

River Manambovo or Afo-voto.—From the point just mentioned, the coast trends 26 miles westward to the mouth of the River Manambovo, called also Afo-voto, apparently from the name of a locality some 7 or 8 miles inland.

Coast.—From this river, westward, the coast, as already stated, changes its aspect, becoming rocky and rising perpendicularly from the coast, and so continues to Cape St. Mary, a distance of 37 miles; the only verdure to be seen in this space being in the vicinity of streams. Carambules (Karimbolo) point is about 17 miles westward of the Manambovo, and just westward of it is a small creek of the same name. At Carambules point, and for some distance on each side, the reefs bordering the coast extend in places from one to $1\frac{1}{2}$ miles off-shore; and about 2 miles eastward of the point, the reefs form the little port of Betanta, where there is a village, but the only house visible from the sea is that of a trader, and it has a flagstaff; the place is of no importance.

From Carambules point, Cape St. Mary bears W. $\frac{1}{4}$ N. distant about 20 miles, the coast being high, rocky, and bordered with rocks the whole distance, but with the River Manamboro running into the sea through a gap about halfway between the two points.

Shoal.—A shoal, on which the s.s. *Goth* struck, is reported to exist about $16\frac{1}{2}$ miles eastward of Cape St. Mary, and $3\frac{1}{2}$ miles off-shore, but its position is doubtful, and is so shown on the chart. The coast in this neighbourhood should be given a berth of at least 5 miles.

CAPE ST. MARY (Lat. $25^{\circ} 40'$ S., Long. $45^{\circ} 6'$ E.), the southern headland of Madagascar, is high, with perpendicular cliffs; the vicinity of the cape is still higher, rising towards the mountains in the interior, and the land can be seen at a great distance. The extreme point is a small promontory of blackish rocks, projecting at least a mile from the cliff and terminating in an isolated pointed rock, not perceptible from the westward.

The coast between Fort Dauphin and Croker bay, westward of Cape St. Mary, is inhabited by the Antanos and Machikores. But little is known of them; they appear to wish for communication with Europeans, as they light fires apparently to attract attention, and assemble on the beach making signs. The surf and general conditions, however, would make any attempt at landing hazardous in the extreme.

Tides.—It is high water, full and change, at Cape St. Mary at 4h. 30m.; springs are said to rise 10 or 12 feet. This can only be considered as an approximation.

General charts 597, 748a.

Chart 760, Cape St. Mary to Beavato island, &c. Var. 15° W.

Soundings.—From Fort Dauphin to Cape St. Mary, the coast is generally steep-to, with no off-lying dangers, except the ones mentioned on the previous page, eastward of Cape St. Mary. There are depths of 30 to 40 fathoms from 4 to 12 miles from the coast, between Fort Dauphin and Cape Andavaka; westward of the latter the bank apparently grows outwards until just eastward of Cape St. Mary, where there are 40 fathoms at a distance of about 22 miles from the coast.

In 1898, the *Harlech Castle* found rather less water than the charted depth, at an estimated distance of from 10 to 15 miles off the land, in the vicinity and eastward of Cape St. Mary, but the soundings were taken by night and the positions by dead reckoning, and are therefore scarcely reliable.

Discoloured water.—In May, 1891, the Italian barque *Orel* reported having passed through two patches of highly discoloured water in lat. 26° 25' S., long. 52° 27' E., or about 310 miles from the nearest part of the south-eastern coast of Madagascar, where ocean depths are supposed to exist. No soundings were taken, nor has any further report on the subject been received. Probably, the cause of discoloration was the presence of marine animalculæ, by which and similar appearances mariners have often been deceived.

Currents.—For currents in the neighbourhood of Cape St. Mary, *see* pages 21-23. It should, however, be remarked that vessels near the land in the immediate vicinity of Cape St. Mary have found the current with a decided tendency to set towards the land, sometimes as much as one knot an hour.

Winds.—For Winds on S.E. and South coasts of Madagascar, *see* pages 8, 9.

General charts 597, 748a.

CHAPTER VIII.

MADAGASCAR N.W. COAST.—ADJACENT ISLANDS AND REEFS.—
CAPE AMBER TO AMBAVATOBI BAY.

(Lat. $11^{\circ} 30'$ S. to Lat. $15^{\circ} 35'$ S.)
(Long. $46^{\circ} 0'$ E. to Long. $49^{\circ} 20'$ E.)

Variation in 1911.—Decreasing $6'$ to $7'$ annually.

Plan 724, Glorioso islands. Var. $6^{\circ} 10'$ W.

ISLANDS and REEFS.—GLORIOSO ISLANDS.—

The centre of the reef comprising these islands and rocks bears N.W. $\frac{1}{2}$ W. and is distant about 98 miles from the Orontani peninsula, the nearest part of Madagascar. The group was formally annexed by France in August, 1892; it consists of several rocks above water, and of two small islands, the latter on and near either end of a coral reef 9 miles in length E.N.E. and W.S.W., with a mean breadth of nearly 2 miles. There is no break or channel through, though about $1\frac{1}{2}$ miles eastward of the western island, Île Glorieuse, the reef is less than 5 cables wide; and, as the sea does not at all times break at this part while breaking heavily elsewhere, there is danger of mistaking it for a passage. The greater part of the reef is dry at low water, and a narrow strip extends N.N.E. $\frac{1}{2}$ E. a distance of $2\frac{1}{2}$ miles from Île Glorieuse.

The coastline of all these sandy islands changes with the time of the year, especially when the N.W. and S.E. monsoons are at their strongest.

The islands have been leased by the French Government to M. Calteaux, who is the official resident; they are inhabited by about 30 Malagasy labourers from Nosi Bé, who work the guano, and also cultivate a certain quantity of maize and mapemba.

The bank of soundings extends about 8 cables north-westward, and only 5 cables south-westward of Île Glorieuse; also about one mile along the south-eastern side of the reef, 2 miles eastward, and 4 or 5 miles off the whole of the northern side; beyond which distances, the depth is over 100 fathoms.

The S.E. monsoon blows from April to the beginning of November, during which time calms are of rare occurrence; the N.W. monsoon

General charts 758, 2762, 597, 748a, b.

Plan 724, Glorioso islands. Var. 6° 10' W.

blows from the middle of December to April with frequent intervals of calms, this is the rainy season. The principal products are cocoanuts, turtle shells, and salt fish; green turtles are abundant and form the staple food of the inhabitants, who are dependent on rain for drinking water.

Ile Glorieuse (*Lat. 11° 34' S., Long. 47° 18' E.*) is the southwestern and largest island, approaching square in shape, $1\frac{1}{2}$ miles in extent each way, composed of coral conglomerate and enough sandy earth to produce trees about 40 feet high, with which it is covered. There are some cocoanut and casuarina trees on the north end of the island, which are visible from a distance of about 12 miles.

The settlement is at the northern end of the island.

Ile du Lise, on the northern side, and more than 2 miles within the eastern end of the reef, is upwards of 5 miles from Ile Glorieuse and about 5 cables long East and West; its northern side is clifty and the southern point terminates in a sandhill which is the highest part of the island. When seen from the northward about 10 miles distant, it shows as three small hummocks with trees between, which grow to a height of about 35 feet. A salt water lagoon occupies the centre of the island, and nearly divides it North and South. A reef extends for a considerable distance eastward of this island. Two water tanks, capable of containing 4 tons each, have been fixed, under a little hut, for catching rain water.

Rocks.—Verte rocks are $1\frac{1}{2}$ miles eastward of Ile Glorieuse; they are small and only 3 feet above water. The wreck of a large vessel was lying against the Verte rocks in 1882. South rocks are on the coral ledge about 3 cables southward of Ile Glorieuse, and about 3 feet above water.

Anchorage.—There is good anchorage in 8 fathoms, sand, and level bottom, with Ile du Lise bearing S.S.E. distant 8 cables. Also good anchorage off the west side of Ile Glorieuse, in about 15 fathoms, with the flagstaff in line with the Resident's house, bearing S. 36° E.; this anchorage is very convenient for merchant vessels, as it is close to an opening in the reef, through which boats can reach the beach at low water.

Tides.—It is high water, full and change, at Glorioso islands at 5h.; springs rise about 10 feet, but the tides are irregular, it being high water at the same time, during the five days of the *Alert's* visit.

Tidal stream.—At the anchorage off the west side of Ile Glorieuse the ebb stream was found setting W.S.W. about $1\frac{1}{2}$ knots. At the anchorage off Ile du Lise the tidal stream was, during the

General charts 2762, 597, 748a, b.

Plan 724, Glorioso islands. Var. 6° 10' W.

Alert's visit, very slight, the flood running westward and the ebb eastward.

Current.—Between lat. 10° S. and the Glorioso islands, the current sets strongly westward; and in the month of May, it has been found to set in that direction nearly 3 knots.

Chart 758, Cape St. Andrew to Antongil bay.

GEYSER REEF (Lat. 12° 22' S., Long. 46° 25' E.) is a dangerous group of rocks and sandbanks in the form of a crescent convex to the north-westward; it is about 12 miles long in a N.E. and S.W. direction and forms a horse-shoe open to South-east. The south-western part, for a distance of about 10 miles, uncovers in parts at low water. The depth on the north-eastern part of the bank is not known, but Mr. Richards, master of H.M.S. *Geyser*, described it as a barrier of shoal water which they considered dangerous to cross in that vessel. Inside the horse-shoe, the depths are from 17 to 20 fathoms.

The vessel *Shannon*, bound to Aden with coal in 1842, was wrecked on the Geyser reef. Captain Tuckett of that vessel describes it as a dangerous reef extending E.N.E. and W.S.W., with numerous rocks, most of which dry at low water, many being visible at half ebb. At three-quarters ebb, they counted seventeen rocks, large and small, above water, besides some dry sandbanks, the largest rocks appearing about the size of boats under sail. There are several swash-ways between the reefs, with apparently deep water. Remnants of other wrecks appeared bedded in the sand.

The Geyser reef is so named from having been partly examined by H.M.S. *Geyser* in 1848. It was originally discovered by the vessel *Firebrass* in 1682, and afterwards seen by the *Devonshire* in 1766. At 18 miles northward of the Geyser reef is the Bisson rock, in long. 46° 27' E., of very doubtful existence. In 1831, the whaling barque *Rover* saw a shoal and described it as extending E.S.E. and W.N.W. about 10 miles, of which 4 or 5 miles uncovered at half ebb, and other parts were conspicuous by high breakers; this vessel considered the shoal to be some 3 or 4 miles westward of the charted position of the Geyser reef. In 1832, the whaler *Borneo* was wrecked on a shoal, giving its position as lat. 12° 11' 30" S., long. 46° 24' E.; it is now charted in lat. 12° 14' S., long. 46° 10' E., and, as with the Bisson rock and the *Rover's* supposed discovery is marked E.D.

From the similarity of descriptions of these reefs by their discoverers, and in accordance with the opinion of Mr. Richards, it is thought more than probable that the dangers hitherto reported under the name of

General charts 2762, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 6° 40' W.

Firebrass, Borneo, Rover, and Bisson, are none other than the Geyser reef, and that there is no danger beyond the known limits of that reef. This assumption, however, is not as yet proved, and for the present the reported positions of these shoals are continued on the charts, awaiting further examination; pending which, caution is necessary when in the vicinity.

CAUTION.—The neighbourhood of Geyser reef may be considered the most dangerous part of the Mozambique channel. In fine weather, at high tide, and with smooth water, when the sea does not break, there is even by day but little warning of danger, except by a good lookout and by careful sounding with the deep sea lead; and on the northern side of the shoal, it is uncertain whether the lead will give any warning. Being also on the southern verge of the great west-going current, it is sometimes included in the course of that stream, but more frequently a counter north-easterly current prevails.

ZÉLÉE BANK is on the same bank of soundings as the Geyser reef; the nearest part, where there is a depth of 7 fathoms, being only 6 miles south-westward of the Geyser reef, and the greatest depth between only 30 fathoms. Over a space of 10 or 12 miles East and West, the depth is from 9 to 5½ fathoms; the latter depth being found in several places, but especially near the southern edge of the bank, which is steep-to.

In 1910 the British steamer *Zamora* reported having passed over discoloured water about 5 miles northward of the charted position of the western end of Zélée bank.

LEVEN and CASTOR BANKS.—These large banks of comparatively shallow water, though separated by about one mile of deep water, may be considered as one bank; they lie between lats. 12° 18' S. and 13° 1' S., and between longs. 47° 30' E. and 48° 0' E., the Leven being the north-eastern, and the Castor the south-western bank. The first has from 20 to 25 fathoms at its north-western side, and as little as 10 fathoms at the southern end, near the Castor bank, which latter has several patches of 9 fathoms, and one of 7 fathoms near the centre; that patch is 35 miles north-westward of Nosi Bé, the nearest land.

Baron Cawdor shoal, on which a vessel of that name reported striking in 1911, lies north-westward of Leven bank, in lat. 12° 23' S., long. 47° 39½' E.

The vessel's way was not stopped, and no sign of shoal water was observed, but a cast of 28 fathoms, sand, was obtained shortly after striking.

Cordelière bank.—In 1860, the vessel *Cordelière* sounded in from 32 to 36 fathoms, coral and broken shells, about 15 miles northward of the Leven bank.

General charts 2762, 597, 748a, b.

MADAGASCAR.—N.W. COAST.

SOUNDINGS.—From Cape Amber to Ambavatobi peninsula, and onward to Cape St. Andrew, about 400 miles south-westward of Cape Amber, a bank of soundings borders the coast, extending for a distance of from 5 to 15 miles from the coast except off Cape St. Andrew, where it extends nearly 40 miles. This bank, at its outer edge, breaks down almost everywhere quite suddenly to deep water, so that vessels drawing more than 13 feet should be navigated with great care when approaching it; for in some places there are only 16 or 17 feet water over the flats and heads of coral, which flats are often of great extent and lie most frequently at the outer edge of the bank of soundings. It may be also considered certain that from the nature of the bank and adjacent land, it will be many years before all existing dangers are known. Constant use of the lead, and a good lookout from the masthead to give notice of any change in the colour of the water, are necessary and obvious precautions to be taken in navigating these waters.

Chart 1002, Diego Suarez bay to Andranoambi bay.

CAPE AMBER, with its lighthouse, islets, and objects of mark in its vicinity, are fully described at page 235. From the north-westward the cape itself may be seen at a distance of 15 or 20 miles. From the westward, the country westward of the cape presents a broken irregular outline, having numerous hills and hummocks with bare sides, and summits covered with grass. Ambinantsandra or Liverpool hill, 948 feet high, is $8\frac{1}{2}$ miles S.W. $\frac{1}{2}$ S. from Cape Amber lighthouse, is broader and higher than the others, and is covered with trees. A round dark hill near has also trees on it; both these hills may be recognised by their sombre colour. Two miles eastward of Liverpool hill is Ambohitrakoholahi peak, or La Coq, 909 feet high. It is not conspicuous from the north-westward, being shut in by Liverpool hill, but shows up very well from William Pitt bay, and is useful as a leading mark.

From Cape Amber, the coast trends S.W. by W. 15 miles in almost a straight line to Voailava point, but broken by three deep inlets or harbours, as presently described. The passages into these ports are narrow, and their sides fringed by coral reefs; but, within them, vessels can lie at anchor in perfect security.

Current and tidal streams.—Off the west coast of Amber peninsula the combined current and tidal stream generally sets to the northward. On March 25th, 1906, there was found to be a constant set N.E., except for about one hour towards the time of low water, when there was a weak set to the southward; the maximum rate of the N.E. set was $2\frac{6}{10}$ knots, which occurred one hour after high water.

General charts 2762, 597, 748a, b.

Plan of entrance to Port Robinson on 1054. Var. 5° 50' W.

PORT ROBINSON (Lotsoina bay) (Lat. 12° 0' S., Long. 49° 12' E.), about 6 miles from Cape Amber, affords good shelter to steam-vessels of small power awaiting a favourable opportunity to round Cape Amber from the westward, which, however, is not so difficult a matter as was formerly thought; *see* page 236. The entrance is not easily recognised from a distance, but is best seen when bearing about S.E. or S.S.E.; or from aloft, when it may be seen over the coastline, which is very low, flat, and of uniform appearance; it is of coral formation, rising perpendicularly from the sea to a height of 10 or 15 feet, and is covered with bushes. The hills in the background are rounded and thickly wooded.

Depths.—There are depths of 6 fathoms close to the reefs on each side of the entrance, and the channel is nearly straight, in a S.E. by S. direction, with general central depths of from 8 to 13 fathoms for a width of about 120 yards, except between the entrance points where the western reef extends halfway across with a 2-fathoms patch at its edge, on which H.M.S. *Dragon* touched in 1886, reducing the navigable width at that point to less than 100 yards. The principal reefs on either side are visible from the masthead, as there are not more than from 6 to 10 feet over them at low water, but detached patches outside their general edge should be looked out for. The best time for observing the discoloured water over the rocks on entering is naturally in the afternoon, when the sun is westward of the meridian. If circumstances admit, the 2-fathoms patch in the entrance should be buoyed.

After passing the projecting point of the mainland on the port hand, the south-western side of the island on that side of the entrance kept open of the point about N.N.W. $\frac{1}{4}$ W. leads to the southward of the larger shoal beyond on that side, and to the basin within, an open space upwards of one mile long and 5 cables wide, northward of Low island, which latter is covered with bushes and is surrounded by and connected with the southern shore by the shallow reef on which it stands.

Anchorage.—A vessel wishing to anchor in this inner basin may do so as follows:—Having run through the entrance channel, a peculiar square-topped hill will be seen open northward of a dome-topped hill near the coast, and it should be steered for open half the width of the latter until Low island bears about S.W., then edge to the southward and anchor in 8 fathoms, mud, and good holding ground. During nine months of the year, this anchorage is, however, said to be subject to violent squalls sweeping down the harbour, while strong south-easterly winds are blowing over Cape Amber.

Vessels waiting for a lull to round Cape Amber during south-easterly winds may anchor off the entrance in 11 or 12 fathoms, soft mud; but

General charts 758, 2762, 597, 748a, b.

Chart 1002 and plan on 1054. Var. 6° W.

the space is small and close inshore, therefore they must be prepared to weigh on a shift of wind. The *Fawn* anchored in the harbour entrance in 11 fathoms, sand and mud, with the North point of entrance bearing N.N.W. $\frac{1}{2}$ W., and Rocky point W. by S.; the reefs being three-quarters of a cable distant on each side of the vessel.

On leaving Port Robinson, vessels should start early in the morning, before the breeze has acquired force, and it might be advisable to mark the inner spit on the starboard hand, as well as the 2-fathoms patch on the port hand, in going out.

Tides.—Tidal streams.—It is high water, full and change, at Port Robinson, at 4h. 15m.; springs rise 7 feet. The flood stream crosses the entrance, running W.S.W. very strongly, therefore care is necessary in entering the channel, but when fairly entered, the stream takes the channel course.

Water may probably be found at all seasons by digging wells in the valley which opens on the north-eastern side of the port.

Chart 1002, Diego Suarez bay to Andranooambi bay.

The Country, northward of Diego Suarez, is uninhabited, and with the exception of an occasional fishing canoe is rarely visited, though in Captain Owen's time there were a few huts round the shores of Port Robinson. The coast is of coral, but the country generally is volcanic, forming irregular hills from 500 to 900 feet high, covered with long rank grass, which in October, when seen at a distance, looks like sand. The valleys are generally marshy, and covered with a prickly green grass, a favourite resort for wild pigs and cattle, which roam about in large herds, formerly affording good sport for the rifle, but now all under ownership; guinea-fowl are also plentiful. Mangrove swamps are few and of small extent. The climate is pleasant on account of the cool breeze generally blowing from the South-east.

Port Jenkinson or Ampanasina is $1\frac{1}{2}$ miles south-westward of Port Robinson, and runs 2 miles inland in a south-easterly direction. In the entrance there are from 7 to 10 fathoms, diminishing to 5 and 4 fathoms after a run inwards of $1\frac{1}{2}$ miles. The entrance is narrow, like that of Port Robinson, and rocks detached from and outside the steep edge of the visible reefs must be guarded against.

Plan of Port Liverpool on 1054.

PORT LIVERPOOL or **Ambavanibé** (Lat. $12^{\circ} 5' S.$, Long. $49^{\circ} 15' E.$) is the largest of the three harbours on the south-western side of Cape Amber, being $5\frac{1}{2}$ miles in length and having inside an average width of more than one mile; the entrance is a mile wide between the points, and 9 miles south-westward of Cape Amber. On each side of the entrance are several hills covered with trees; they

General charts 758, 2762, 597, 748a, b.

Plan of Port Liverpool on 1054. Var. 6° W.

extend back to the mountains, which are generally bare. Liverpool hill, bearing E.S.E. leads to the entrance (*see* view on chart 1002). The Sentinel, Needle, and other rocks on the starboard hand, from 6 to 12 feet high, and the extensive fringing reefs on each side of the entrance are easily seen and avoided at half-flood, but the edges of these reefs are not easily distinguished at high water or with the sun ahead; they contract the navigable channel to a width of about $1\frac{1}{2}$ cables, and form a sharp elbow from the northern shore extending into a bight in the reef on the southern side. The greater portion of the reefs round the inner part of the bay, as well as near the entrance, uncover at low water springs, but are not easily distinguished when covered. Strangers should therefore not enter without sending boats to mark the most prominent shoals.

The depth close outside the entrance, and within the elbow mentioned, is from 16 to 26 fathoms; from thence it decreases irregularly to 13 fathoms at 3 miles within the points, and to less in the southern angle of the port. The entrance is only suitable for steamers, or for sailing vessels with a fair wind; the ordinary south-easterly wind blows through the bay in violent squalls, raising a confused sea causing breakers across the entrance, driving the current over the reefs and making it difficult to distinguish their limits.

These circumstances greatly reduce the advantages which Port Liverpool otherwise offers to vessels requiring shelter when awaiting a lull to round Cape Amber. Early morning is the best time for entering, as the wind is generally lightest, but it is the worst time for seeing the reefs, which are steep to except on the southern side, where a sharp point with dangerous rocky heads runs off beyond the visible reef, with only from 6 to 9 feet over them at high water. The northern side is safest, the reef narrowest, and the edge best defined.

The southern side of the harbour is rendered generally inaccessible by banks, otherwise it would afford better shelter than the northern side, which is free from dangers, but exposed to the wind. The shore is bordered by mangrove, and not easy of access.

Directions.—To clear the entrance leave Sentinel rock distant 6 cables on the starboard hand and keep Ballon hill, 141 feet high (a hill on the coast south-westward of Liverpool hill), in line with Ablette, a conspicuous hill, 357 feet high, near the head of the bay, bearing S. 51° E. When abreast Needle rock haul to the southward to clear the coral reef on the northern side of the channel, and then to the northward to clear the reef eastward of Needle rock. When Liverpool hill bears E. $\frac{1}{2}$ S. steer for Tirailleuse hill, keeping it bearing S. 26° E., this will lead up to the anchorage.

General charts 1002, 758, 2762, 597, 748a, b.

Plan of Port Liverpool on 105½. Var. 6° W.

Anchorage.—The anchorage space is greatly contracted by a ledge of rocks protruding from the southern side, and by a detached ledge in the south-eastern part. The best berth during the S.E. monsoon is in the south-eastern part of the harbour, under the lee of Tirailleuse hill. The wind at that season often sweeps down the harbour in violent gusts, causing vessels to drag their anchors.

Tides.—**Tidal streams.**—It is high water, full and change, at 4h. 18m.; springs rise 10½ feet and neaps 8½ feet above the datum of the chart, which is 2 feet 8 inches below low water ordinary springs. The streams at the entrance, at high water springs, run at from 2 to 3 knots.

Water.—Up to the end of the dry season, or nearly so, a small quantity of water may be obtained about half a mile south-westward of Tirailleuse hill.

There are no inhabitants, but wild cattle and guinea-fowl are numerous. A few canoes visit the harbour for turtle.

Coast.—About 2 miles south-westward of Port Liverpool is a small bay, not examined, but nearly filled with coral and sandbanks. At 3 miles farther, the peninsula which forms the northern end of Madagascar terminates in that direction in Voailava point, a low point of yellow sand, bordered by a fringing reef extending a mile from the shore, and terminating at the rocky islet Nosi Pahanji or Flat rock.

Chart 1002, Diego Suarez bay to Andranoambo bay.

WILLIAM PITT or Andramahiba (Andramaimbo) bay. — Between Voailava point (*Lat. 12° 6' S., Long. 49° 6' E.*) and the salient mountains of Orontani peninsula, which terminate at Cape St. Sebastian, about 29 miles S.W. by W. from Voailava point, the receding coast forms a large bay, broken into a number of smaller bays and encumbered by many islands, reefs, and banks, some fringing the shore, others 9 or 10 miles out at sea, just within the edge of soundings, and nearly in line between Nosi Anambo or Woody island, the outer one, and Voailava point.

These coral reefs and banks are of a dull yellow colour, many of them of vast extent, rising suddenly from deep water and some of them uncovering at spring tides. Others of smaller size are isolated patches, the more dangerous from there being no visible indication of their presence. If we except the reefs near the outer edge of the bank of soundings, which reflect a bright green colour, contrasting strongly with the dark blue tint of the deep water, the banks in this bay may be considered as becoming invisible when covered by a fathom or two of water. The strong south-easterly wind causes a short choppy sea in the bay, which affects the surface only, and at high water causes neither breakers nor ripples in the vicinity of these banks; it is only

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andronoaombi bay. Var. 6° W.

when they are about to uncover that the sea breaks over them; therefore, a vessel navigating this bay cannot rely on a lookout man's warning of danger. There are several entrances to the bay, and also to the inner bays, which are described later on.

Remarkable objects.—Windsor Castle, or Mount Andramaimbo (*Lat. 12° 13' S., Long. 49° 11' E.*), can be seen from all parts of the bay, and is a mass of basaltic columns surmounted by a large broken column standing on a range of hills near the coast, on the isthmus separating it from Diego Suarez, in connection with which it, and its signal station, have already been mentioned at page 237; it is 1,306 feet high, and a most useful landmark. (*See views on chart.*) As seen from the northward the summit consists of large blocks of greyish white stone; the sides are wooded, but the surrounding hills, of volcanic formation, appear brown and bare. Dover castle, or Mount Ankaramisampana, 892 feet high and 2 miles East from Windsor castle, is not plainly seen on the western side of the island, except from the northward; its summit resembles the other but is smaller. Ambatoarara hill, North a distance of $4\frac{1}{2}$ miles from Windsor castle, is a mass of basaltic rocks with a rounded summit, 646 feet high, covered with baobabs and other clustering trees, but denuded of foliage in the dry season; it is on the northern side of the entrance to Port Chancellor. Ankitikona, nearly 9 miles south-westward of Windsor castle, and upwards of one mile inland from the head of Ambararata bay, is a hill 876 feet high, and covered with trees; it shows a dark outline against the surrounding heights. Ambohiposa, 1,685 feet high, is the highest point of the Orontani peninsula. In the distance, about 20 miles E.S.E. from the last-named hill, is Mount Amber, described at page 237, and easily recognised by its height and massive appearance; it dominates the country in every direction.

Depths.—In the outer roadstead there are depths of from $5\frac{1}{4}$ to 10 fathoms; to reach it from the southward there is a least depth of $5\frac{1}{4}$ fathoms; through the channels to the northward there is a least depth of $3\frac{1}{4}$ and 5 fathoms.

In the inner roadstead there is a depth of from 6 to 17 fathoms; to reach it from the southward there is a least depth of 7 fathoms; from the northward there are two channels available for vessels up to 18 feet draught, one for vessels of about 8 feet, and one only available for light-draught vessels.

OUTER ISLETS and DANGERS.—The following islands, rocks, and banks lie opposite William Pitt bay, commencing from the eastward and taking the outer part first.

Nosi Pahanji (Flat rock), off Voailava point, is flat and 18 feet high; a detached rock 4 feet high lies off its northern end, and from the rock a reef extends 4 cables west and south.

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoambi bay. Var. 6° W.

Nosi Hao (Hay island) is one mile in length N.N.E. and S.S.W., a quarter of a mile wide, and is flat, rocky, and partly covered with brushwood; the north end is 36 feet high. There is a passage leading into the inner bays, between it and Voailava point, described at page 334. The island is surrounded, except at the south extreme, by extensive reefs which extend three-quarters of a mile north and $1\frac{1}{4}$ miles south-east from it; the 50-fathoms line of soundings is only about one-third of a mile outside the northern reef.

Nosi Vaha (Moresby) is very small, flat, and bare, it is 24 feet high, and is surrounded by reefs; a small detached rock, 11 feet high, lies off its south-west extreme.

From the west end of the reef a narrow bank, with depths of 4 to 5 fathoms over it, extends about $2\frac{1}{2}$ miles west, and from the east end a long coral bank, having from one to 2 fathoms over it, extends to north-east and nearly joins the shoals north-west of Nosi Hao; there are two channels through the reef, one about $1\frac{3}{4}$ miles from Nosi Vaha, 2 cables wide, with $3\frac{3}{4}$ fathoms in it, and the other, *Passe de la Rance*, about 3 cables wide with $3\frac{1}{4}$ fathoms in it.

Nosi Mavoni (D'Apres rock) lies S.W. by S. distant $1\frac{1}{2}$ miles from Nosi Hao; it is very small, rises to a peak, 98 feet high, and is surrounded by a narrow reef; it lies on the northern extreme of a long line of coral reefs.

Nosi Foti (Moorsom sand) lies S.W. $\frac{3}{4}$ W. distant $5\frac{1}{2}$ miles from the southern end of Nosi Hao, it is 21 feet high, flat, partly covered with brushwood, and bordered by a beach which renders it conspicuous in bright weather; it is surrounded by an extensive reef which rises from a sandy bottom and shows plainly.

Nosi Fasi, or Magnet sand, is nearly awash, drying about $1\frac{1}{2}$ feet at low water, and can be seen with difficulty except when the sea breaks on it. It is about $6\frac{1}{2}$ miles W. by S. $\frac{1}{4}$ S. from Nosi Vaha, centre to centre, and 11 miles off-shore, with deep water close to on its northern side.

Nosi Fati, or Delight sand (*Lat. 12° 12' S., Long. 48° 48' E.*), lies $5\frac{1}{2}$ miles W. $\frac{1}{2}$ S. from Nosi Fasi, centre from centre, and is 12 miles from the nearest land, the northern extreme of the Orontani peninsula. On the sand-patch, which dries about 6 feet, is a rock 6 feet above high water, and the bank can otherwise be distinguished by its whiteness, except at high water. The lead gives but very little warning when approaching from the northward, as the edge of soundings is very steep-to, and on the bank the depths are irregular, with less than 5 fathoms at one mile from the rock in most directions.

Nosi Anambo, or Woody island, is the westernmost object visible near the outer edge of soundings opposite William Pitt bay, being $7\frac{1}{2}$ miles N. by W. $\frac{3}{4}$ W. from Nosi Valiha or Joseph island, and may be considered as a warning for the others. It is a strip of sand

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoambi bay. Var. 6° W.

surrounded by reef, on which is a row of casuarinas. The depths near vary from 4 to 14 fathoms, and at $3\frac{1}{2}$ miles northward of the island the lead falls suddenly from 8 or 10 fathoms into deep water.

LIGHT (*Lat. 12° 16' S., Long. 48° 39' E.*).—On the western end of Nosi Anambo, from a cylindrical tower, painted in black and white horizontal bands, 43 feet high, is exhibited at an elevation of 39 feet above high water, a *fixed white* light, visible in clear weather from a distance of 17 miles.

Shoal.—A dangerous 4-fathoms patch lies some little distance within the western edge of the bank, about $9\frac{1}{2}$ miles S.W. by W. from Nosi Anambo, and 11 miles W. by N. $\frac{1}{4}$ N. from Nosi Valiha. In 1864, the French ship of war *Licorne* anchored in $8\frac{1}{4}$ fathoms about 3 miles north-westward of this 4-fathoms patch.

Chart 758, Cape St. Andrew to Antongil bay.

Intermediate bank.—A bank with about 20 fathoms and of some extent was found by Captain Owen 21 miles W. by N. $\frac{1}{2}$ N. from Cape St. Sebastian, or some 7 or 8 miles westward of the 4-fathoms patch just described.

Chart 1002, Diego Suarez bay to Andranoambi bay.

Outer roadstead.—Good anchorage may be found anywhere within the triangle formed by Nosi Foti, Nosi Vaha, and Nosi Fasi; the bottom is generally sand and coral, between 5 and 10 fathoms, and mud and sand, and mud beyond that depth. If anchoring near the western side of this triangle, vessels must be careful not to anchor in the deep trench which lies to the eastward and south-eastward of Nosi Fasi, as in the trench the bottom is very irregular, the tidal streams at times are very strong, the holding is bad, and the sea rough during the S.E. monsoon.

Directions.—Vessels desiring to make this anchorage, if from the southward, should, after rounding Cape St. Sebastian, bring the summit of Nosi Mavoni (Andromache islands) to touch the left tangent of Kalomisampana, bearing S. 72° W.; keeping this mark on astern will lead between Yangtse rock and Ambasavaka rocks, in deep water; when Nosi Tanga is just open of north-west extreme of Cape St. Sebastian, S. 48° W., steer with these marks on astern until Nosi Vaha is sighted, when it should be steered for and anchorage taken up as convenient.

If coming from the northward there are two entrances, one westward of Nosi Vaha, the other through the *Passe de la Rance*.

If taking the first channel, when Nosi Vaha bears about S. 34° E., bring the right tangent of Nosi Lakandava on with La Diable (a conspicuous peak southward of Grand Pelé), S. 12° W.; these marks will lead across the bank in 5 fathoms, about one mile to the westward of Nosi Vaha. Should the hills be covered, which frequently happens during the winter season, the centre of Nosi Foti in line with the

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 6° W.

summit of Nosi Antanalovo, S. 3° E., will lead through; Nosi Antanalovo will be seen between Nosi Hara and Nosi Anjombavola, almost touching the latter.

If using the Passe de la Rance, Ankitikona summit in line with the eastern extreme of Nosi Mavoni, S. 9° E., leads between the reefs, in $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, and half a mile inside the pass over $3\frac{1}{4}$ fathoms. This channel is very useful for vessels of moderate draught wishing to make Courrier bay; it has been examined very carefully by the *Rance*, and used by her at low water springs.

INNER ISLETS and DANGERS. — Nosi Hara (Chatham island) (*Lat. 12° 14' S., Long. 49° 1' E.*) is the largest of a group of basaltic rocks, it is 2 miles long, N.E. and S.W., and 417 feet high at its southern end; the northern point is a large round rock 348 feet high, appearing from a distance to be separate, but joined to the main island by a tongue of sand, thus affording shelter to fishing boats. At all other parts of the island, except the southern extreme, the cliffs are steep and inaccessible.

At $1\frac{1}{2}$ miles N.W. from Nosi Hara is Nosi Antanalovo, 112 feet high, and having shoals extending 3 cables north-west and south-east; in a W.S.W. direction from Nosi Hara are the large islands Nosi Anjombavola, 299 feet high, which has a very rugged appearance, and Nosi Lakandava, 190 feet high, which is very steep on its northern side, and at its southern end has an isthmus of sand, where there is good landing; the small island Nosi Andantsara, 174 feet high, lies between them. The latter has two peaks, separated by a cutting, which is very conspicuous when seen from the southward. North of Nosi Anjombavola is Nosi Belomotro, 102 feet high, and in a N.W. direction Nosi Ambatomarangitsi, 125 feet high; all are rugged and cliffy. A reef lies 4 cables N.N.W. from Nosi Ambatomarangitsi, with a channel between, and there is a small rock, 16 feet high, between Nosi Lakandava and Nosi Andantsara. South distant one mile from Nosi Anjombavola is Nosi Meli (Pointu rock), 118 feet high, which has a remarkable detached granite block, 69 feet high, close southward of it; East, distant 7 cables from Nosi Meli, is The Lion, 38 feet high; at a distance of 8 cables S. 25° E. from Nosi Meli is a rock with $4\frac{1}{2}$ fathoms over it, and at one mile N. 60° W. from the same is a detached coral head with $2\frac{3}{4}$ fathoms over it.

Anchorage.—There is excellent anchorage in $7\frac{1}{2}$ to 10 fathoms, mud, under the shelter of the west coast of Nosi Hara, with the summit of Nosi Lakandava in line with the summit of Nosi Belomotro, bearing S. 78° W.; the Lion rock open to the right of S.W. point of Nosi Hara, S. 14° W., and Nosi Mavoni just shut in by the N.W. point of Nosi Hara.

If bound for this anchorage, when inside Passe de la Rance, Amba-

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 6° W.

tobé summit open westward of Nosi Antanalovo, S. 33° W., leads westward of reefs north-eastward of Nosi Hara.

Reefs.—**Great reef** is $1\frac{1}{2}$ miles long north and south and lies 2 miles westward of Nosi Meli; it has a detached reef half a mile off its northern extreme and two detached reefs off its southern end, the outer one being $1\frac{1}{2}$ miles from that extreme. Shoals extend further south towards Baron point, the outer of 3 fathoms being 2 miles N. 11° W. from Baron point; at $1\frac{1}{2}$ miles west of this shoal is another with $3\frac{1}{2}$ fathoms over it. N.W. of the reef are two detached rocks, one of $4\frac{1}{2}$ fathoms at $2\frac{1}{2}$ miles S. 75° W. from Nosi Lakandava, the other of 4 fathoms lying $2\frac{3}{4}$ miles N. 56° W. from the same island.

Nosi Meli just open to the westward of the N.W. point of Nosi Hara, N. 33° E., leads between the shoals southward of Great reef and the mainland.

Nosi Hara reefs lie $1\frac{1}{2}$ miles S.E. from Nosi Hara, they consist of three detached reefs, extending about one mile N.E. and S.W.; the northern reef dries 6 feet.

Little Pass banks are two detached banks $1\frac{1}{2}$ miles E. by S. from the north end of Nosi Hara, they have $1\frac{1}{2}$ fathoms over them at the shoalest parts. The south extreme of Nosi Anjombavola open to the left of south extreme of Nosi Hara, S. 77° W., leads between Nosi Hara reefs and Little Pass banks.

Between Nosi Hara and Nosi Hao lie a number of reefs having several channels between them, amongst which are Capricorn pass, immediately north of Nosi Hara, and North and South passes, south of Nosi Hao, presently described.

Nosi Famaho (Limaçon) (*Lat. 12° 14' S., Long. 49° 4' E.*) is a small basaltic islet, $2\frac{1}{2}$ miles eastward of Nosi Hara, 66 feet high, and covered with bushes. The sandy beach on the northern side is bordered by a narrow reef, showing plainly; the depth close to on the southern and eastern sides is from 8 to 13 fathoms.

Shoal water extends 6 cables north-west from the island which practically forms the south-eastern end of the shoals between Nosi Hara and Nosi Hao, the 5-fathoms line running almost direct from the island to the south-eastern end of Nosi Hao reef.

Fosse reef is a detached reef 4 miles S.E. by E. from Nosi Hao, it is 6 cables long N.W. and S.E., and dries in parts; shoal water extends north-west and north-east from the reef, but the south-east end is steep-to. A shoal with $2\frac{1}{2}$ fathoms over it lies one mile S.W. from Fosse reef; there is deep water between them and also between the shoal and the main reef.

West rock of Cristaux in line with Andramaimbo peak, S. 50° E., leads between Fosse reef and East reef.

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranooambi bay. Var. 6° W.

East reef lies 2 miles S.E. from Nosi Hao, it is separated from Nosi Hao reefs by a channel $2\frac{1}{2}$ cables wide, which has a bank of $3\frac{3}{4}$ fathoms across the northern entrance and depths of 8 and 9 fathoms in the channel.

Nosi Mpay is a small round island, 20 feet high, $3\frac{1}{2}$ miles E. by S. from Nosi Hao, it is fringed by a reef on the south and east sides; a rock, one foot high, lies on the edge of the reef about one cable S.W. of the summit. Shoal water extends about 2 cables from the northern end, and a detached shoal, with $3\frac{1}{2}$ fathoms over it, lies 6 cables N.N.W. of the island.

Inner roadstead (*Lat. 12° 11' S., Long. 49° 7' E.*).—There is a large available space for anchorage inside Nosi Hara and the reefs to the north-eastward, but the northern part is not recommended on account of the irregularity of the bottom, the strong tidal streams which sometimes run, and the choppy sea which is experienced there during the S.E. monsoon. The several bays on the east side and their anchorages will be described later on.

CHANNELS.—The most convenient channel for vessels coming from the southward is the one between Great reef and the mainland. After passing between Nosi Valiha and Maruteza point, as described at page 331, when Ambohiposa summit bears S. 6° E., steer with Poto-poto summit in line with Ankitikona, East; this leads between the reefs off Befotaka bay and the detached shoals S.W. of Great reef. When Baron point bears S. 9° E. bring Nosi Meli just open to the westward of the N.W. point of Nosi Hara, N. 33° E., steer on this mark until Nosi Famaho is in line with La Coq, N. 54° E., steer on this mark, and when Mangoaka point is in line with West Mamelie, N. 85° E., steer on that mark until Cristaux is in line with La Coq, N. 51° E., which mark will lead in clear of all further dangers. A more direct course, but one which leads very close to the reefs off Ampasimena bay, is when Baron point bears S. 3° E. bring Ambatoarara summit in line with the left extreme of Nosi Famaho, N. 51° E., and keep on this mark until the West Mamelie is in line with Mangoaka point.

Pass of Nosi Hao.—This pass is the most direct for vessels coming from the northward, but it cannot be recommended, as the channels are narrow, reefs on each side not very visible at high water, tidal streams very strong, no good leading marks, and nowhere to anchor in case of accidents. It may, however, be taken by vessels of light draught at low water by keeping Nosi Famaho S. 8° W. until Ambatoarara summit is in line with Nosi Mpay, S. 75° E., which marks steered on will lead between the reefs.

Vessels coming from the northward are therefore recommended to approach the Inner roadstead through the Outer roadstead, for which

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoambi bay. Var. 6° W.

the following two channels are practicable for the largest vessels : Between Great reef and Nosi Lakandava, a very safe channel, with depths of 13 to 18 fathoms, and only one patch of $2\frac{3}{4}$ fathoms to be avoided ; La Selle peak in line with the Lion, S. 81° E., leads through. The channel between Nosi Anjombavola and Nosi Hara is also very safe, as there are depths of 7 fathoms close to the shores on both sides.

The following two channels through the reefs between Nosi Hara and Nosi Hao have been thoroughly examined, and may be safely used by vessels up to 18 feet draught :—

Capricorn pass is between Nosi Hara and Double reef. Nosi Hara may be approached within three-quarters of a cable. Ankitikona summit open to the right of the 38-foot detached rock off the western point of Ambararata bay, S. 24° E., leads through the channel.

North pass is to the southward of Nosi Hao reef, there is a depth of $3\frac{3}{4}$ to $4\frac{1}{2}$ fathoms in the channel. Cristaux just open to the left of a small elongated wood, situated on the N.E. spur of Andramaimbo hill, S. 56° E., leads through the first part of the channel, and the rock southward of Nosi Vaha open to the right of the northern end of Nosi Mavoni, N. 75° W., kept on astern, leads through the eastern part of the channel. On these leading marks there is nothing less than 3 fathoms. At the western entrance is a rock with $2\frac{1}{2}$ feet over it, which shows well at low water. When through the pass, West rock of Cristaux in line with Andramaimbo peak, S. 50° E., leads between East and Fosse reefs.

South pass (Lat. $12^{\circ} 9' S.$, Long. $49^{\circ} 4' E.$) is between Middle reef and Passes reef ; Cristaux in line with the left side of the wooded bluff westward of Lomotro village, S. 63° E., will lead through the channel in nothing less than 9 feet, but care must be taken not to get to the southward of this line, as there is a rock with only one foot over it at the eastern entrance to the pass, and not far from the leading line.

CAUTION.—In a general way, and above all during the monsoon, it is advisable, when the vessel's draught may be ignored, to make the passes at about low water, as then the water is clear and the coral reefs show up well. When the sea is rough, with the wind and tidal streams against each other, or even when the monsoon is strong, the line of the channels is very hard to see, and if the leading marks are not very clear the channels will be found very hard to follow.

Antsantsa bay is the first recess in the shore on the northern side of William Pitt bay ; it commences about 2 miles eastward of Voailava point, and is about 2 miles wide, being bounded on the southeastern side by the detached steep hill Ambatoarara, described at page 329. The northern side of Antsantsa is bordered by a fringing reef, and

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Chart 1002, Diego Suarez bay to Andranoambi bay. Var. 6° W.

shoals extend $1\frac{1}{2}$ miles South from it, the outer, having $1\frac{1}{2}$ fathoms over it, lies $1\frac{1}{2}$ miles S. 58° E. from Nosi Mpay. On the eastern side is the smaller bay Miroana; between these two bays a shoal, with 2 fathoms over it, extends 8 cables from the shore, and at the entrance to Miroana bay is a shoal of $4\frac{1}{2}$ fathoms.

The anchorage is in 5 or 6 fathoms, good holding ground, with a cleft in the rock on the side of Ambatoarara, bearing about S. $\frac{1}{2}$ W. distant 5 cables. Here, a vessel will be in smooth water, but will feel the strength of the wind, which on this coast blows almost continuously.

Good shelter from south-easterly winds is afforded for small craft, in Miroana bay, under the lee of Ambatoarara.

Landing may be effected on a sandy beach at the south-eastern side and inner part of the bay eastward of the mangroves. There are no inhabitants near the bay.

Amponkarana bay or Port Chancellor (*Lat. $12^\circ 9' S.$, Long. $49^\circ 11' E.$*) is in the north-eastern angle of William Pitt bay, and on the south-eastern side of Ambatoarara. The bay is about $1\frac{1}{2}$ miles wide, and it recedes about one mile from a line connecting the points. The northern side of entrance is moderately bold round the foot of the Ambatoarara promontory, which is bordered by a narrow fringing reef; but at about 2 cables westward from that shore is a rocky bank, extending W.S.W. for a distance of about $1\frac{1}{4}$ miles, and having a least depth of $1\frac{3}{4}$ fathoms over it, which must be guarded against; also at a distance of one mile farther in the bay is a rock with only a few inches over it at low water, but with 7 or 8 fathoms on either side, and a 4-fathoms passage about 3 cables wide between it and a large detached bed of coral, with one or two feet water only, lying E.N.E. from it, which practically divides the bay into two parts.

The southern side of entrance is a long point covered with trees, and, from it, a sandspit extends under water N.N.E. 4 or 5 cables; the colour of the water clearly marks its end. North-westward of the sandspit is the detached coral patch, and north-eastward of it the large bed of coral just described.

At the northern side of the bay, the shore bank uncovers a long distance out; from the southern shore, a reef runs off, in some places a distance of 5 cables, and the coast is covered by mangroves.

Directions.—Vessels of deep draught coming from the westward should, when past Fosse reef, bring La Coq in line with the left fall of Ambatoarara hill, N. 65° E.; steer on this, and when Voailava point is in line with the southern extreme of Nosi Pahanji, N. 34° W., steer

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Chart 1002, Diego Suarez bay to Andranomambi bay. Var. 6° W.

with it astern until Nosi Mavoni is just open to the southward of the rock off Nosi Vaha, N. 75° W., when steer into the bay with this bearing on astern until Cristaux is in line with Ambohiposa summit, S. 55° W., which mark must also be kept on astern if wishing to make the eastern anchorage, until the west extreme of Ambatoarara peninsula is in line with Voailava point, N. 58° W., which mark kept on will lead to the anchorage recommended.

Vessels of light draught may proceed into the bay by a more direct route by keeping the rock S.W. of Nosi Mpay in line with Voailava point, N. 41° W. If coming from the southward vessels drawing less than 20 feet may take the channel inside Cristaux, which islet will be left on the port hand, and La Coq brought in line with a small wood to the right of Cut summit, N. 50° E. When Wooded bluff (Lomotro) bears S. 13° E., the vessel is in 22 feet, and course must be altered to the northward, as La Coq becomes shut in by the hills in front, so as to bring Cristaux on with Ambohiposa summit, and then proceed as before described.

Anchorage (*Lat. 12° 9' S., Long. 49° 11' E.*).—A small vessel may find tolerable shelter from the prevailing south-easterly winds in the northern part of the bay, between two points of rock in front of a small beach. The best anchorage is in the eastern part of the bay in 5½ fathoms, mud, with the left extreme of Ambatoarara peninsula in line with Voailava point, N. 58° W., and the south point of the entrance in line with Cristaux, S. 67° W. Small vessels may go closer in-shore, and anchor with the south point of entrance in line with Voailava point.

Landing.—There are two beaches in the eastern part, where landing may be easily effected; the northern one is situated near a small fishing village eastward of a conspicuous bare hill, 142 feet high, the other one is about one mile to the south-eastward. The only landing place on the south coast is at the mouth of a stream just to the west of a small cliff, which is the end of a fairly high spur.

Water.—Three rivers flow into the east part of the bay, and small boats may ascend at high water above the mangroves, to where the rivers flow into the plain, and thus obtain fresh water even during the dry season.

Coast.—Southward of Amponkarana bay, the coast rises in bare slopes 100 to 300 feet high, and is bordered by a fringing reef extending about 5 cables off-shore, and shoal water extends 5 cables outside this. From the point 1½ miles S.W. from the south-west point of Amponkarana bay a long line of shoals extends nearly 3 miles north-westward, having 2½ fathoms on its outer end.

Southward of this point the coast runs in about half a mile, forming a small bay, at the head of which is the fishing village Lomotro, lying

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Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 6³ W.

close to the mouth of a river which small boats can ascend, at high water, for a distance of half a mile, and obtain fresh water all the year round. On the south side of the bay is a conspicuous rounded bluff, 247 feet high, covered with casuarinas and baobabs; it may be seen for a considerable distance, and forms one of the leading marks for the South pass.

At 3 miles S.W. $\frac{1}{2}$ S. from Ambatoarara point is the small islet Cristaux (Crystals), 34 feet high, composed of two masses of rock united at the base; there is deep water all round the islet, and at $1\frac{1}{4}$ miles N.E. of it is a reef which dries 2 feet: this is one of the long line of shoals before mentioned.

COURRIER BAY is about 5 miles southward of Amponkarana bay, and its north-eastern side is overlooked by the high hill Windsor castle (Andramaimbo), which is a good landmark in all directions and lies on the northern side of Col du Courier. On the south side of the neck lie the Mamelles, two rounded and bare summits, 814 feet high. From these hills a chain of hills runs to the S.S.W., the slopes of which are covered with forests and furrowed with streams; the highest part of this chain is Bare summit, 1,155 feet high, thickly wooded on its southern slope; at the southern end of the range, near the bottom of the bay, is La Selle, 492 feet high; here also is a wooded hill, 233 feet high, which rises from the middle of the marsh and is fairly conspicuous. The importance of this small bay is due to the narrowness of the isthmus and ease of access across it to Port Nièvre in Diego Suarez bay, the distance being only $3\frac{3}{4}$ miles across the isthmus and the ground not very high. The shore is bordered by mangroves; at the northern corner, and where the road runs to Diego, is the village of Andramaimbo, where there is a military station and a flagstaff; another village, Bobatolana, lies at the southern end of the mangroves. There is a village at the head of the bay, and some fishing huts on the eastern side of Basse point. Off the northern point of the bay shoals extend about one mile West. Off Basse point, the southern point of the bay, shoals extend one mile N.N.W., a patch which dries 3 feet being 8 cables from the point. At 2 miles E.N.E. from the same point, and nearly one mile from the eastern shore of the bay, is a small islet, I. du Courier, 30 feet high, and having a detached rock, 8 feet high, off its western end; shoal water extends from the shore to the islet, and also about 6 cables N.W. of the islet.

Outer shoals. — Entrance shoal (*Lat. 12° 13' S., Long. 49° 7' E.*), with a least depth of 4 feet over it, coral bottom, is situated 2 miles N. 9° W. from Basse point; it is about one cable wide, and has depths of from $1\frac{3}{4}$ to $3\frac{1}{4}$ fathoms over it, extending for about 2 cables in a southerly direction.

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Chart 1002, Diego Suarez bay to Andranomambi bay. Var. 6° W.

Between Entrance shoal and the shoals off Basse point are two patches of $4\frac{1}{2}$ and $4\frac{1}{2}$ fathoms. At 8 cables S.W. of Entrance shoal is a patch with $4\frac{3}{4}$ fathoms over it, and at $1\frac{1}{4}$ miles W. by N. of it on the edge of the 10-fathoms line are two patches of $3\frac{3}{4}$ and $4\frac{1}{4}$ fathoms.

Cristaux in line with La Coq, N. 51° E., leads between Entrance shoal and the two patches westward of it. The southern end of I. du Courrier in line with West Mamelles, S. 76° E., leads between Entrance shoal and the shoal water off Basse point.

Anchorage (*Lat. $12^\circ 13'$ S., Long. $49^\circ 9'$ E.*).—This bay affords excellent shelter, as it is only open to the north-west, and even in that direction the sea is broken by the outer banks. The bottom is either coral, or muddy sand, the latter affording good holding ground. Vessels may anchor almost anywhere clear of the reefs, in from 5 to 8 fathoms, being careful to secure a muddy bottom, but during the S.E. monsoon the heavy off-shore squalls make it very unpleasant unless anchored close in-shore, which is not practicable in the southern part of the bay except for vessels of very light draught. The snugest anchorage is northward of I. du Courrier, in from $3\frac{3}{4}$ to $4\frac{1}{4}$ fathoms, mud, with the eastern extreme of I. du Courrier in line with the 233 feet wooded hill at the bottom of the bay, S. 26° W., and the Mamelles just open to the right of the military station at Andramaimbo village, S. 48° E.; this last mark is not very visible.

Directions.—To make the anchorage recommended, vessels from the northward should steer in with the 8-foot rock off the western end of I. du Courrier in line with Bare summit, S. 37° E.; those from the southward with West Mamelles in line with the southern extreme of I. du Courrier S. 76° E. In both cases, when Andramaimbo peak bears N. 76° E., steer for it on that bearing until Mamelles are just open to the right of the military station at Andramaimbo, S. 48° E., when steer for the station and anchor as recommended.

Landing.—The most convenient landing place is on a small sandy beach to the right of Andramaimbo village. Northward of this spot a line of rocks, which uncover, extends about 2 cables to a general depth of from 6 to 9 feet; boats must be on their guard against these when approaching at half tide; landing may also be effected close to Bohatolana village, and on the east coast of Basse point, by the huts, but during the S.E. monsoon it is advisable to land on the west side of this point.

Tides.—It is high water, full and change, at Courrier bay at 4h. 21m.; springs rise 10 feet above the datum of the chart, which is about a foot below low water ordinary springs. Neaps rise 7 feet above the same datum.

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Chart 1002, Diego Suarez bay to Andranooambi bay. Var. 6° W.

Water.—Three fairly important rivers run into the bay, the Andramaimbo, which flows in by the village of that name, a larger one just to the southward, which appears to come from Bare summit, and the Mangoaka, which empties itself into the bottom of the bay. Fresh water may be procured all the year round in any of these rivers by ascending high enough. The Mangoaka is said, by the natives, to swarm with alligators.

Communication.—Opposite the anchorage is the termination of the path from Port Nièvre in Diego Suarez bay; the distance is about 8 nautical miles, and the time occupied in traversing it about 3 hours.

Mangoaka village is on a hillock over a river of that name on the southern side of the bay, about 2 miles inland, hidden by trees, and not visible from the sea. The surrounding country is comparatively rich with gardens, rice-fields, and banana plantations. Rice, dried fish, cattle, milk, eggs, and poultry may be procured here.

Ambararata bay (*Lat. 12° 17' S., Long. 49° 5' E.*) is open to the northward only, and is about 2 miles south-westward of Courrier bay at the foot of Ankitekona hill. At the northern point of the bay is Mangoaka point, the extremity of a wooded hillock, 335 feet high, which has an extensive fringing reef and a shoal spit, with 4 to 5 fathoms over it, extending 1½ miles N.W. from its western end; there is also a detached coral head, with 2¾ fathoms over it, 9 cables N. 45° W. from the point. The western point of entrance is extended northward and eastward by some islets and a reef which dries; the northern islet is 12 feet high. The head of the bay is bordered by masses of mangroves, amongst which a number of streams discharge a quantity of alluvial deposit, which has formed a shallow extending far from the shore. There is a flagstaff in the large village of Ambararata, where a native Governor resides, north of the mouth of Ambararata river, and a group of villages, Angoheli, is at the bottom of the bay, surrounded by rice-fields and banana plantations, but not visible from the bay.

On the southern side of the bay, and about one mile inland, is the impenetrable wooded peak Ankitikona, 876 feet high, which is very conspicuous from all directions.

Anchorage.—Vessels drawing less than 19 feet may anchor on the east side of the bay, off the southern end of Mangoaka peninsula, or in the S.W. part with Nosi Hara N.E. summit (348 feet) in line with the 12-foot rock at western entrance of the bay, N. 29° W. and Cristaux just open of Mangoaka point, N. 34° E. The bottom is everywhere mud, and the holding ground good.

The off-shore squalls are very severe in this bay at times.

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Chart 1002, Diego Suarez bay to Andranomambi bay. Var. 6° W.

River.—The principal stream, discharging amongst the mangroves and casuarinas, is the Ambararata river. It descends between deep perpendicular banks worn in the red clay; it is barred at the entrance, not admitting boats at low water; but, inside, is a depth of from 10 to 13 feet, and boats may ascend about 2 miles, where fresh water may be obtained at all seasons. There are other and wider streams, but they are level with the land and everywhere fordable.

Coast.—The general trend of the coast from Ambararata bay is about W.S.W. for $8\frac{1}{2}$ miles to Baron point, but it is decidedly convex towards the N.W., and in it are the two small bays of Manankarana and Ampasimena. The former can only be visited at high water, but the latter offers a very useful shelter, especially during the N.E. squalls at the changes of the seasons; landing can be effected here at high water close to the village, where a few fishermen live; about this part, and as far as Potopoto, the fringing coral reef extends a mile from the coast. Potopoto hill stands isolated on the coast, it is of massive shape, 195 feet high, round, yellow, and bare. Behind it, and not visible from the sea, is the village of Ambovobé, consisting of about a dozen cottages. On the summit is a surveyor's mark in sandstone. The coast from thence bends in a S.S.W. direction for about 2 miles to Baron point, a wooded bluff 228 feet high, forming the eastern entrance point of Befotaka bay, and also the northern extreme of the little bay Ironono, included within the larger bay. The point is surrounded by mangroves and fringed with a reef which extends some distance southward into Ironono bay.

Anchorage.—A small detached bank lies one mile northward of Baron point, and north-eastward of that bank there is anchorage on muddy sand, good holding ground, sheltered from south-easterly winds, off the mouth of the River Mahamindro, which falls into the sea just southward of Potopoto hill. Approaching from the westward, the soundings decrease gradually towards the anchorage.

The River Mahamindro flows into the sea through a mangrove swamp. It may be ascended by boats about 2 miles, where it becomes nearly dry during the monsoon, but with a great flow of water in the rainy season. Another small stream, supposed to be an arm of the Mahamindro, but called the Ironono on the chart, enters the sea through mangroves on the northern side of Baron point, and is not navigable even by boats.

Reefs.—For a description of the reefs lying immediately off this part of the coast, see page 333.

Ironono bay and village (*Lat. 12° 24' S., Long. 48° 58' E.*).
—From Baron point a large reef extends from the sandy beach, which

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Chart 1902, Diego Suarez bay to Andranoaombi bay. Var. 6° W.

runs round the bay until beyond the village of Ironono, the reef also following round the shore until past the village, where it is 4 cables wide. Southward of the village, which consists of about 20 cottages, there is a small cove enclosed by white cliffs, conspicuous from the offing as they contrast strongly with the red earth of the surrounding country. Here is the mouth of a deep rivulet, which flows between perpendicular clay banks and discharges among mangroves.

Anchorage.—The bay is open to the swell from seaward and unsafe during strong westerly winds. Small craft should anchor in the southern part opposite the cliffs in 5 fathoms or less, according to draught, but taking care to avoid the reefs round the shore which are not visible at high water. To reach the anchorage from the westward, a vessel having cleared the northern point of the Orontani peninsula, should bring, and keep, Mont Roti, 914 feet high, in line with the bare summit of Mont Ironono, 451 feet high, and only $1\frac{1}{4}$ miles inshore from the bay, bearing E. $\frac{3}{4}$ S.; this leads at least 8 cables southward of two dangerous reefs in the entrance of Befotaka bay.

Landing.—The best landing place is in the mouth of the river, southward of the village; the river can be entered at all times, and is under shelter, but the reefs at all other parts render the shore unapproachable at low water.

BEFOTAKA BAY (*Lat. 12° 27' S., Long. 48° 55' E.*).—This large bay is $6\frac{1}{2}$ miles wide between its entrance points, and recedes from that line about the same distance to its head. The eastern side is formed by the land trending to the southward from Baron point, until, at the head of the bay, it joins the Orontani peninsula, of which the coast forms the western side. The eastern shore is bordered by fringing coral reefs, in some places extending a mile off-shore; on the western side, they extend but a short distance.

Dangers.—There are four detached banks which uncover at low water, springs; two at the entrance, already mentioned as dangers to be avoided in making for Ironono bay; and two in the inner part of the bay; also a bank near the centre, towards the head, with only 3 feet over it; the latter is situated S.W. by W. $\frac{1}{2}$ W. a distance of 2 miles from Nosi Mahonotsa, an islet 119 feet high, on the eastern side of the bay.

Of the two banks in the inner part of the bay which uncover, one is on the eastern side at the edge of the fringing reef, about 7 cables north-westward from Nosi Mahonotsa; the other, known as Andriva Rangotro, is a large reef half a mile long, East and West, and a little less North and South, and is detached from the western shore about halfway up the bay; besides a spot which dries 2 feet at the eastern

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Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 6° W.

end of the bank, there are several patches with less than 3 feet water; and, from a depth of 10 feet near the edge, the water quickly deepens to 10 and 11 fathoms on all sides.

A small shoal, with only $1\frac{1}{2}$ fathoms over it, lies N.W. by N. a distance of $2\frac{1}{2}$ miles from Nosi Mahonotsa.

Of the two dangerous reefs at the entrance, the eastern bank dries $1\frac{1}{2}$ feet at springs, and, within the 5-fathoms line, is about 5 cables in extent N.N.W. and S.S.E. by half that width; its centre bears W. $\frac{1}{4}$ N., and is distant $3\frac{1}{2}$ miles from the North tangent of Baron point. The western bank is double the size of the eastern, and dries about one foot in two patches; its southern drying patch is 2 miles westward of the other bank, and lies N. by E. $\frac{1}{2}$ E. a distance of $2\frac{1}{2}$ miles from the N.E. extreme of the Orontani peninsula.

The eastern bank is steep-to close round; the western bank is steep-to on the eastern side, but the 10-fathoms line extends nearly half a mile from the dry patches on the other sides of the bank. North-westward of the western bank, and separated by a deep channel over half a mile wide, is a shoal bank $2\frac{1}{2}$ miles long, the northern extreme has not been defined, and the least water found is $4\frac{1}{2}$ fathoms; north-eastward of this bank, and at a distance of $1\frac{3}{4}$ miles, is a detached coral head, with $1\frac{1}{2}$ fathoms over it.

Anchorage.—Throughout the bay when clear of the shoals, a bottom of muddy sand affords good holding ground, and the mean depth of water about 11 fathoms, decreasing towards the shore, renders it suitable for anchorage; but it is quite open to the northward.

Villages, &c.—Several groups of huts may be seen near the coast, and the large village of Befotaka in the south-eastern bight; also the villages Rangotso and Antamanaka near the coast on the western side of the bay. The last village in this direction is abreast of the little islet Nosi Misangi (*Lat. 12° 25' S., Long. 48° 52' E.*), which stands on the shore reef and is connected with the shore at low water. In this vicinity several brooks run throughout the dry season, and about 2 miles in the background amongst the yellow denuded hills which border this coast is the peak of Ambatobé, 848 feet high, remarkable for its dark colour and steep sides; Grand Pelé is a remarkable bare flat hill, 992 feet high, lying about one mile inland from the head of the bay, and a line of wooded conical summits runs from it north-north-eastward to the coast. Behind Grand Pelé a chain of hills extends S.E., having three conspicuous summits, La Table, 1,080 feet high, La Coin, 1,072 feet, and La Diable, 1,330 feet; this chain lies eastward of Ampamonti bay. From Nosi Misangi westward to Cape St. Sebastian, the coast appears to be uninhabited.

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Chart 1002, Diego Suarez bay to Andranomombi bay. Var. 6° 10' W.

Cascade (*Lat. 12° 31' S., Long. 48° 58' E.*).—Near the south-eastern part of the bay, about 3 or 4 miles inland, a magnificent cascade may be seen, when bearing about S.E. by S., rushing from a broad and rapid stream, flowing through a dark ravine between two high hills on the side of Mount Amber, and falling 120 feet or more perpendicularly; from thence, it flows through a crooked and steep descent to the plain below, and ultimately into the sea through the mangroves, where, however, it is not available for watering a vessel.

Local winds, &c.—During the S.E. monsoon, from April to December, the wind comes over the land northward of Potopoto hill with great force, commencing at 7 a.m., continues all day, and frequently through the night, only moderating in the morning previous to freshening again. Southward of Potopoto, the south-easterly wind frequently lulls towards noon, and a rather fresh S.W. breeze rises about 2 p.m.; in such cases, in the immediate vicinity of Potopoto, it often remains calm.

Potopoto hill may also be considered as the point of separation of the coast into two very distinct zones. To the northward one is sheltered from the ocean swell by the islands and banks, already described, but there is very little shelter from the S.E. monsoon, except close under the land. To the southward, on the contrary, in Befotaka bay, and round Cape St. Sebastian, the south-westerly swell is strongly felt, especially during the months of January, February, and March; landing is difficult, but one is sheltered from the S.E. monsoon by Mount Amber and its numerous spurs. Even at the height of the monsoon there is scarcely any wind in Befotaka bay.

The regular course of the rains is likewise different; during the winter season the showers are frequent at sea to the southward of Potopoto, and even more frequent along the coast and in the interior of the country. To the northward, on the contrary, if it is raining in the interior or in the bays on the coast, it is frequently not raining in the Outer roadstead.

Tidal streams and currents in this neighbourhood are irregular. The flood stream generally runs south-westward, and the ebb north-eastward; they are sometimes very strong and cause eddies in the channels about Nosi Hao. When the breeze is fresh at St. Sebastian the sea becomes covered with foam as though there were breakers in the channels.

CAUTION.—The water on this part of the coast and towards Nosi Lava being turbid, the coral reefs can only be seen at a short distance, and they are very steep-to, so that the lead gives but little warning. Patches of spawn occasionally have the appearance of coral reefs, and the water sometimes appears yellow over a depth of

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Chart 1002, Diego Suarez bay to Andranomambi bay. Var. 6° W.

4 fathoms. This yellow discoloration sometimes appears in large patches giving every appearance of dangerous shoals, without the lead showing any change of depth. It may be due either to spawn or to mud stirred up from the bottom by tidal or other influences.

Orontani peninsula.—Cape St. Sebastian (Mandoa-Voa) (*Lat. 12° 27' S., Long. 48° 44' E.*).—William Pitt bay, as already stated, is bounded on the West by the mountainous Orontani peninsula, which projects about 11 miles seaward in a N.N.W. direction from the general coast-line, and has many pointed hills; but Amboliposa, the highest, has a rounded top rising 1,685 feet above the sea, from which the naked and steep sides of the upper parts join gradual declivities terminating at Maruteza point, the northern extreme of the peninsula, and also at Cape St. Sebastian, the western extreme.

The shores round the northern and western sides of the peninsula are safe of approach, but are bordered by a fringing reef steep-to. Off Maruteza point lie the detached Ambasavaka rocks, standing above water on a steep reef; they may be safely passed at about 5 cables. Between them and the shore reef is a narrow rocky 6-fathoms channel.

Detached islets.—About 5 cables north-westward of Cape St. Sebastian is Nosi Tanga, 257 feet high and about 500 yards in extent, with a chain of high rocks extending from its southern end, the southernmost 215 feet high, and others close round its shores.

Ambamonetsimani lies about $2\frac{3}{4}$ cables S.W. by W. $\frac{1}{2}$ W. from the high southern rock just mentioned; it is a small rugged rock, like a hay stack, rising 54 feet above the sea.

Mandazona lies S. by W. $\frac{1}{2}$ W. a distance of $1\frac{3}{4}$ miles from Nosi Tanga, is about 450 yards in length N.N.E. and S.S.W., and rises to a height of 392 feet.

Tsiankazo, 198 feet high, extends one mile southward from Cape St. Sebastian, to which it is attached by a reef dry at low water, and with a rock above high water halfway along that reef.

The passage round Cape St. Sebastian, passing eastward of the three first-named islets, has depths of from 10 to 15 fathoms, with a navigable width of $3\frac{1}{2}$ cables, and is perfectly safe, there being no hidden dangers.

Anchorage.—A vessel waiting for daylight to enter one of the bays, may find anchorage just northward of Cape St. Sebastian. The northern side of this small bay is bordered by reef which becomes very narrow in the southern part, where vessels should anchor. The depth decreases rapidly from 26 to 18 fathoms in the pass through the Andromache islands, to 10 and 8 fathoms, and from thence gradually to the

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 6° 10' W. shore; vessels should anchor as close in as possible; the bottom is hard sand, good holding ground. This is a good anchorage during fine weather, but not in the rainy season. Ambamonetsimani, in line with the southern end of Nosi Mananono, marks the limit of a depth of 16 feet; the reef commences a short distance inside that line.

Care must be taken to avoid the reefs off the two points northward of this anchorage. Both may be cleared by keeping Mandazona islet open westward of Cape St. Sebastian.

A small stream discharges through the mangroves into this little bay, and the tide is felt in it for a few hundred yards from the beach; beyond the tidal limit are a few pools of muddy water. The surrounding country appears parched.

Local wind.—During the S.E. monsoon, the south-easterly breeze generally rises with the sun and acquires its full force between 8 and 10 a.m. It falls light, almost to a calm, about one hour after noon, or perhaps a light sea-breeze may set in and continue until sunset, when it again becomes calm, and so remains until morning. It sometimes happens that the south-easterly wind blows without interruption for many successive days, or it lulls a little towards evening, to freshen up again about midnight.

During the rainy season, this coast is subject to gales from seaward.

ANDROMACHE ISLANDS lie from 2 to 5 miles westward and north-westward of the headland, of which Cape St. Sebastian is the western extreme; between the group and the mainland is a channel with from 10 to 22 fathoms; and between Nosi Valiha and the south-western islands is a pass with from 20 to 26 fathoms.

Nosi Valiha (Joseph island) (*Lat. 12° 23' S., Long. 48° 43' E.*), is 3 miles North from the cape, but less than 2 miles from the north-western point of the peninsula, the nearest part of the mainland; it is 471 feet high in its southern part. A narrow bank extends 3 miles north-westward from the island, having from 4 to 6 fathoms over it; a similar bank extends nearly the same distance eastward from the island, with from $5\frac{1}{2}$ to 9 fathoms, but with one spot of $1\frac{1}{2}$ fathoms, named Yang-tse rock, which lies $8\frac{1}{2}$ cables East of the eastern end of the island. For clearing mark *see* Directions, page 331. The soundings on each side of both banks, and round the island, are from 10 to 15 and 18 fathoms.

Nosi Mananono (Nourse island), one mile long North and South, and 661 feet high, is 3 miles westward of the cape, and separated from it by a channel in which are the detached rocks and islets already described. North-westward of it, on or near a bank extending 2 miles from it, with from 6 to 8 fathoms, are the following islets:—Kalomisampa, showing two heads at $1\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from

General charts 758, 2762, 597, 748a, b.

Chart 1002, Diego Suarez bay to Andranoaombi bay. Var. 6° 10' W.
the northern end of Mananono; Nosi Fisaka, $1\frac{1}{2}$ miles N.W. from the same point; and Nosi Mavoni, a mere rock but 133 feet high, $2\frac{1}{2}$ cables south-westward of Fisaka.

Coast.—The south-western side of the Orontani peninsula is partially exposed to wind and sea from the South-east, which strikes it obliquely, but there are a number of protected anchorages affording shelter in case of need. The coast is free from danger, except a very narrow fringing reef which may be coasted at a distance of a mile. The only detached shoal which uncovers at low water is the Ampamonti bank, described at page 350, southward of the entrance of Ampamonti bay.

A number of small villages, each consisting of a few cottages only, are scattered along the coast and at the inner parts of the bays; the natives live chiefly by rearing cattle. Fowls and fruit in small quantities may be obtained at the villages, but with difficulty.

There are several mountain streams, generally flowing into mangrove swamps at their mouths during the rainy season, but dry in the summer. There is a lack of fresh water everywhere; the natives dig holes in the earth and so procure sufficient for their wants.

Rantabé bay.—This small bay, on the southern side of Cape St. Sebastian, is between Tsiankazo and the western point of Andranoaombi bay; it is completely open to the southward, and the shore is bounded by a fringing reef. Native boats enter it at high water by passing over the reef connecting the cape and Tsiankazo.

Plan of Andranoaombi bay on 317.

ANDRANOAOOMBI BAY.—Nosi Antolo, off the entrance of the bay; and the islets Faninana, 179 feet high, and Antolohizana, $1\frac{1}{2}$ miles north-eastward of it, are remarkable for their perpendicular basaltic cliffs on the sea side.

Nosi Antolo (*Lat. 12° 29' S., Long. 48° 46' E.*) lies exactly off the middle of the entrance; it is steep except on its eastern side, where a reef dries out about $1\frac{1}{2}$ cables, and southward of that reef, for about the same distance, there are less than 5 fathoms.

The islets Faninana and Antolohizana are $2\frac{1}{2}$ cables apart, but being connected by coral banks with but little water over them, the passage between is impracticable. Antolohizana is attached to the shore by a natural bank composed of black basaltic shingle, which uncovers entirely at low water, but a boat may pass over it at high tide. The space between Antolohizana and the coast, northward of the dyke, is interspersed with rocks and reefs of considerable extent.

Depths, &c.—The bay recedes about 2 miles from the entrance with an average width of about 7 cables. The depth decreases from

General charts 758, 2762, 597, 748a, b.

Plan of Andranoaombi bay on 317. Var. 6° 16' W.

10 or 12 fathoms in the entrances to $6\frac{1}{2}$ fathoms halfway up, and to less than 5 fathoms when within 8 cables of the head, where it dries out about 3 cables at low water. Within the 5-fathoms line, a detached reef, near the western side at the head of the bay, surrounded on three sides by from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms, dries at low water. The western side of the bay is fringed by a narrow reef, and the point on that side is safe; but, on the eastern side, the reef extends a considerable distance from the shore, especially off the points at the inner part.

Several small villages lie along the eastern side of Andranoaombi bay, and a rivulet discharges among the mangroves at the head; close to it is a pyramidal hill covered with trees.

Anchorage.—The *Tirailleuse* anchored in $2\frac{3}{4}$ fathoms, mud, in front of Ambaro, the northernmost village, with Nosi Antolo open eastward of the western entrance point of the bay. Larger vessels would of course anchor farther out; but the bay affords good protection from all winds except those from westward of South, which rarely occur except in the rainy season, when squalls of short duration are sometimes very severe. In the dry season, when the south-easterly wind is in full force, a heavy swell turns into and reaches the inner part of the bay, rendering the anchorage uneasy.

Antsimaloto bay (*Lat. 12° 29' S., Long. 48° 47' E.*), the small indentation between the bay just described and the islets outside it, does not afford good anchorage. The *Tirailleuse*, however, anchored here in $3\frac{3}{4}$ fathoms, mud, with the northern side of Faninana in line with the southern end of Nosi Lava or Little Minow. The northern side of Faninana in line with the Sugarloaf, Minow islands, marks the limit of the depth of 10 feet, where the coral rocks near Antolohizana commence.

Chart 758, Cape St. Andrew to Antongil bay.

Anchorage.—About halfway between Antsimaloto and the western point of entrance to Ampamonti bay, a river, larger than others on this peninsula, flows into the sea, and has deposited a bank of mud extending a considerable distance out. This affords anchorage, but can only be considered as a temporary stopping place, though it is slightly sheltered on the southern side by the projecting point of Ampamonti bay. The *Tirailleuse* anchored in 4 fathoms, mud, in front of Antsahabé village, over which there then grew a remarkably large palm tree; with the southern part of Mandazona in line with the centre of Mananono, and the remarkable palm tree in line with the summit of the distant hills behind the village. The latter mark, supposing it still to be available, leads in clear of the reef off the rocky point which forms the northern limit of the anchorage.

General charts 758, 2762, 597, 748a, b.

Plan of Ampamonti and Ampasindava bays on 317. Var. 6° 10' W.

AMPAMONTI BAY is about 10 miles south-eastward from Cape St. Sebastian; about one mile inshore from the head of the bay is Wooded cone, a cone-shaped hill 717 feet high, with trees to the summit. The bay has many small villages round its shores, and affords good protection, being only open to the S.W., and even in that direction partly sheltered by islands and reefs.

Oravaka point is the western point of entrance, and is fringed by a reef which continues round the inner part of the bay. Oravaka islet, about 5 cables from the point, but less than half that distance from the edge of the fringing reef, is 44 feet high; between it and the Jio Jio rocks the channel is clear. These rocks are 24 feet high, in the centre of the entrance, and the shoals off them occupy a space nearly a mile long within a depth of 3 fathoms, and dry for half that distance.

Nosi Antali (*Lat. 12° 34' S., Long. 48° 52' E.*), 1½ miles eastward of Oravaka islet, is 474 feet high, 6 cables in diameter, round topped, covered with trees, in the inner part of the bay, and separated from the northern side by a narrow channel; a detached bank, with 12 feet water, lies 4½ cables southward of Nosi Antali.

The northern part of the bay is occupied by mud banks, caused by the deposit from a small river, which discharges among the mangroves.

Nosi Vori is an islet nearly 5 cables in diameter lying 8 cables southward of the Jio Jio rocks, and 228 feet high; on its eastern side are some cottages; it is about 7 cables from the eastern coast, where stands the village of Ampasimanahi, and it is separated from that shore by a bank with 3 fathoms over it.

Depths.—The general depths in the entrance of the bay are from 6 to 8 fathoms, shoaling to less than 5 fathoms directly a vessel is within the Jio Jio rocks, and to less than 3 fathoms when within Nosi Antali. There is a 2-fathoms channel between that island and the northern shore, which is practicable for a vessel of 10 feet draught, but only in the hands of one thoroughly acquainted with it, and a 7-fathoms channel between the Jio Jio rocks and Nosi Vori, leading in to the anchorage, in from 6½ to 5 fathoms, or less, off Ampasimanahi village.

Directions.—On approaching from the northward, vessels should pass outside Oravaka islet; or, if necessary, they may even pass between the islet and the shore reef, the channel, though narrow, being clear and with a least depth of 4½ fathoms. They may then, if bound for the inner anchorage, pass between the Jio Jio rocks and Nosi Antali, keeping within 2½ cables of the latter to avoid the 12-foot patch southward of it; or they may pass between the Jio Jio rocks and

General charts 758, 2762, 597, 748a, b.

Plan of Ampamonti and Ampasindava bays on 317. Var. 6° 10' W.

Nosi Vori, steering about East, until the Wooded cone comes in line with another hill on the coast at the head of the bay, of the same form but only 164 feet high; that leading mark should then be followed, as it will lead eastward of the bank southward of Nosi Antali, and through regular soundings to the head of the bay. This leading mark is also an excellent one for small vessels from the southward as it leads in safety into the bay, passing eastward of the Ampamonti bank and over the 3-fathoms bank between Nosi Vori and the shore.

There are sometimes strong tidal streams causing eddies and a chopping sea off the south-eastern point of Nosi Vori.

Vessels from the direction of the Minow islands, bound to Ampamonti, should keep the Sugar-loaf on with or open northward of Nosi Lava; this will lead westward of Ampamonti bank towards Oravaka point, to a position for entering the bay.

A stranger coming from the southward should not pass northward of a line joining Nosi Valiha and Cape St. Sebastian before recognising the different landmarks; that line passes 5 miles from the coast about Ampamonti.

Anchorage.—The bay affords excellent shelter for vessels of light draught; those drawing 18 feet or upwards can anchor in the entrance, where they will be sufficiently protected from south-easterly winds by the projecting coast and by Nosi Vori, and it is only exposed during the westerly squalls which generally take place in the month of March.

A small vessel will find the best shelter eastward of Nosi Antali in from 3 to 2½ fathoms, mud; but in rounding the south-eastern part of that island, she must guard against the sandspits extending some little distance from its coast.

Tides.—It is high water, full and change, in Ampamonti bay, at 4h. 23m.; springs rise 10½ feet.

Ampasindava bay.—Nosi Tsiringidringitra stands on a coral reef on the southern side of the entrance to this bay, N.N.W. distant 6 cables from Bemoka point, and is joined to the land by a narrow ridge of stone resting on the reef, the latter being covered at high water.

Ampamonti bank (*Lat. 12° 39' S., Long. 48° 51' E.*).—At one mile westward of Nosi Tsiringidringitra is this detached coral reef, which uncovers at spring tides; but in calm weather, when covered by a few feet, there is no appearance or warning of danger even at a short distance. Within a depth of 3 fathoms, the reef is 6½ cables in extent E. by S. and W. by N., by 5 cables wide at its western end; it is surrounded at a short distance seaward by depths of from 8 to

General charts 758, 2762, 597, 748a, b.

Plan of Ampamonti and Ampasindava bays on 317. Var. 6° 10' W.

10 fathoms, and there are from 7 to 8 fathoms between it and the shore.

The Wooded cone well open West of Nosi Vori, or the western side of the latter bearing N.E., leads westward of the Ampamonti bank; and, as before stated, the Wooded cone in line with the smaller cone N.N.E. $\frac{1}{2}$ E. leads between the bank and the shore.

Ampasindava bay is limited on the North by Bekotoko point, and on the South, for all practical purposes, by reefs extending from Bemoka point and from the southern side of the bay out to Nosi Tsiringidringitra. Between these limits, Ampasindava point projects from the head of the bay, just northward of Ampasindava village, thus forming two creeks; that to the southward is bordered by a sandy beach, and a reef which becomes narrow as it approaches the village. The other, bordered by mangroves, receives the small rivulet Ampampa, and dries out level with the entrance points of the river.

This bay affords good temporary anchorage in from $6\frac{1}{2}$ to $3\frac{1}{2}$ fathoms, being sufficiently sheltered from south-easterly winds by Bemoka point and the island and reefs extending from it.

Chart 758, Cape St. Andrew to Antongil bay.

Ankazomalemi bay (Lat. $12^{\circ} 42'$ S., Long. $48^{\circ} 54'$ E.) is a deep bend in the coastline about 2 miles southward of the bay last described, and is $2\frac{1}{2}$ or 3 miles wide, facing W.S.W., between Nosi Satza, off the northern entrance point of the same name, and Andamoti point, the southern boundary, about 160 feet high; a reef, which partly uncovers, extends from the latter point about a mile to seaward, and continues as a fringing reef round the bay as far as the mangroves which border the inner part. Behind the mangroves to the eastward will be seen Mount Amber, described at page 237, and the intermediate undulations of thickly wooded high land.

The bay is occupied by mud banks and shallow water, which oblige vessels to anchor at the entrance, about an equal distance from each point.

Ankazomalemi village, stands behind the mangroves; another village will be seen near Satza point.

Plan of Nosi Mitsio on 708.

Nosi-ni-Andriana.—Between Andamoti point and Nosi-ni-Andriana, the coast is bordered with shoals and coral rocks, which extend to that island and beyond, but the latter part becomes narrow. Round the bay, the reef forms a band parallel with the shore, with an opening opposite Ambavoniaombi village. Nosi-ni-Andriana is uninhabited, and is said to be used as a cemetery; it is connected with the shore by a tongue of sand and rock which uncovers at low water, but

General charts 2762, 597, 748a, b.

Plan of Nosi Mitsio on 708. Var. 6° 20' W.

over which is a practicable passage at high water for small country boats. A small stream opposite the island bears a similar name.

Temporary anchorage may be found southward of the island in about 4 fathoms, mud, not far from the edge of the rocks.

Andiako point (*Lat. 12° 47' S., Long. 48° 55' E.*).—Southward of Nosi-ni-Andriana, the rocky coast becomes lower as the distance from the Orontani peninsula increases, and terminates at Andiako point with its extended reef, which appears to indicate nearly the southern limit of the rocks and coral beds found so generally along the coast southward of Cape St. Sebastian.

Southward of Andiako point, the mountains recede towards the interior, leaving between them and the sea low plains covered with vegetation; the coast at the same time falls back and forms a broad bay bordered by mangroves and filled with the alluvial deposit of many rivers. Eastward of the meridian of Andiako point, the depth is 2 fathoms and less, and there is no passage to the inner part of the bay, but anchorage suitable for small craft, in 2½ fathoms, mud, may be had southward of Andiako point, protected from the south-easterly wind, which, in this vicinity, generally dies away at sunset.

The River Sahinana flows into the bay about 2½ miles south-eastward of Andiako point; it is about 200 yards wide, but barred by sand-banks, over which there is very little water.

General remarks.—Northward of Andiako point, it is not safe to approach the coast for the purpose of anchoring during the night, on account of the rocks and coral reefs which border it so generally, though they do not extend far off-shore. A vessel wishing to anchor off Andiako, should bring Ankarea island, Minow islands, to bear West and well open southward of the Sugar-loaf, in order to get southward of that point. These two remarkable bluff hills show well against the horizon, ordinarily clear to the westward after sunset, and remain visible long after other land has disappeared from view. In case of fog coming on before reaching the anchorage, a vessel should not go into less than 6 or 7 fathoms.

Farther southward, vessels may anchor off sandy beach; the bottom is then mud and the depth moderate, decreasing gradually towards the shore, and the lead is a sufficient guide at night. The coast being low and of dark colour does not show out against the mountains in the background, which are often hidden by haze; a vessel might be very near the shore without seeing anything unless by chance a fire or light in a village.

The inhabitants of this part of Madagascar are of the Antankarana tribe of the Sakalava race; some earn a living by fishing and catching turtle, and go a considerable distance along the coast in their canoes.

General charts 758, 2762, 597, 748a, b.

Plan of Nosi Mitsio on 708. Var. 6° 20' W.

The soil above the basaltic rock is usually very thin, except in the valleys, and with the exception of the sides of Mount Amber and some few wooded places, the principal growth is coarse grass, which is extensively burnt annually to promote the growth of young grass. Cultivation is scanty near the sea shore, but rice is grown in the valleys of the interior and large herds of cattle are reared.

The coast is generally bordered by fringing coral reefs; the mouths of the rivulets being mostly closed with sand, and within are mangrove swamps.

NOSI MITSIO (Minow islands).—This assemblage of islands, perpendicular rocks, and coral patches numbers 27 in all. Nosi Mitsio, the largest island, is about 15 miles from the coast of Madagascar, and of irregular shape. With the exception of two or three of coral formation and low, the whole of these islands are composed of lofty basaltic columns, which, either straight or curved, form most of the precipices and prominent points. Those at the north-western extreme of Nosi Mitsio are particularly grand and imposing; being slender, perfectly straight, and about 60 feet in length, varying in the number of their sides from four to six, but generally the latter. Until these islands became a French possession they were governed by a chief who resided near the northern end of Nosi Mitsio.

Ankaranā (*Lat. 12° 50' S., Long. 48° 38' E.*), the North point of the island, is surmounted by the Sugar-loaf hill, 684 feet in height. From that Bluff and the high land extending 2 miles southward from it, a low narrow neck runs S.S.W. about 2 miles; from thence for 3 miles it again widens and turns in an acute angle to the North-west, preserving a width of one mile to the extreme, where it terminates in Mitaraka point; Mt. Mitsio, 513 feet high, is the north end of this projection. When seen from a distance, bearing about S.E., Nosi Mitsio appears like two islands.

The bay, Maribé bay, thus formed on the northern side of the island has general depths of from 5 to 12 fathoms on the eastern side, and from $4\frac{1}{2}$ to 9 fathoms on its western side, and it is open from N.W. by N. to N.N.E. Small vessels find shelter in the southern angle of the bay, in 3 or 4 fathoms, good holding ground. Vessels may sail in with the sea breeze and leave with the land wind, but the space is very limited, and a rock, Prevoyante rock, with less than 6 feet of water over it, lies 4 cables N.W. from Alankirimi point, the point in the middle of the bay.

Plan of Ampasimena bay on 708.

Ampasimena (Diamond) bay is on the eastern side of Nosi Mitsio, and offers good anchorage during the Northern monsoon, in

General charts 758, 2762, 597, 748a, b.

Plan of Nosi Mitsio on 708. Var. 6° 20' W.

9 or 10 fathoms, south-westward of Nosi Vazoana. The *Diamond* in 1877 anchored in 12 fathoms, with the right extreme of that island N. 63° E., and Bevaoko rocks N. 23° W. Anchorage may also be found with Bevaoko rocks bearing N. 67° W. and the western extreme of Nosi Vazoana bearing North.

Bevaoko rocks (Chimney rocks) are one foot high; shoal water extends 3½ cables South and East from them.

In 1875, the *Flying-fish* found good anchorage in Alandrota bay on the south-eastern side of the island, south-westward of One-tree point, in 13 fathoms; protected from the sea breeze by day, but about midnight the land wind from the eastward blew with force, causing a disagreeable sea.

Tides.—It is high water, full and change, at Nosi Mitsio, at 4h. 30m.; springs rise 13 feet, neaps 9 feet above the datum of the charts, which is about 1½ feet below low water ordinary springs.

Tidal streams.—Observations of the tidal streams, off the east coast of Nosi Mitsio, were made in January and February with the N.W. monsoon blowing; it was found that the flood stream generally ran between S.W. and S.E., altering in the opposite direction to the hands of a watch; it was strongest about 3 hours before high water and at high water was very weak and ran east. The ebb stream ran between N.E. North and West, altering in the opposite direction to the hands of a watch, and was most rapid about 3 hours after high water. The strongest stream observed was 1½ knots.

Supplies.—The southern end of the island is well cultivated and presents an agreeable appearance. Supplies are to be obtained such as oxen at a cheap rate, also goats, geese, ducks, fowls, pumpkins, and a little fruit, all at moderate prices.

Ankarea (Lat. 12° 51' S., Long. 48° 36' E.) is an enormous circular rock about 6 cables in diameter and 775 feet high, with a broad summit. It is clear of dangers on its northern and western sides, but southward a small reef extends about 2 cables, and eastward shoal water extends about 5 cables. One mile E.N.E. from Ankarea is Nosi Fisaka, 106 feet high; it is very narrow, and terminates north-westward in some black rocks, and south-eastward in a ridge of shingle with a rock at its extremity three-quarters of a mile from the island; between this shoal and the main island there is a channel about 3 cables wide, but about the middle there is a rock with 2½ fathoms over it.

Nosi Lava (Little Minow), the northernmost of the group, is 5 miles north-eastward of Nosi Mitsio. It is about 4 miles in circumference, 520 feet high, and without vegetation; its shores are

General charts 758, 2762, 597, 748a, b.

Plan of Nosi Mitsio on 708. Var. 6° 20' W.

perpendicular cliffs rising out of deep water. There are from 13 to 16 fathoms round it, which depth increases to over 30 fathoms in the vicinity of Cape St. Sebastian and the islands off that cape.

A rock, which dries one foot, lies 2 cables N.W. from the north point of the island.

As regards a certain yellow discoloration of the water sometimes observed in this locality, *see* Caution, page 344.

Nosi Mangiho is nearly in mid-channel between Nosi Mitsio and the coast; it is small, flat, 14 feet high, and lies nearly in the centre of a reef about one mile in diameter.

Between the Minow islands and the coast of Madagascar the depth is from 13 to 11 fathoms, decreasing to 9 fathoms or less in passing eastward of the meridian of Nosi Mangiho, and 6 and 5 fathoms on approaching the Madagascar coast.

Les Quatre Frères (*Lat. 13° 0' S., Long. 48° 31' E.*).—A group of four islands lies 6 miles S.W. from Nosi Mitsio; they consist of Nosi Betaniazo, 284 feet high; Nosi Betalinjona, 245 feet high; Nosi Behangovo, 202 feet high; and Ansoha, 162 feet high; all are steep, and resemble hayricks. Midway between Nosi Betaniazo and Betalinjona is a rock 6 feet high, and S.S.W. distant 6 cables from the latter island is Baleine rock, 3 feet high. There is deep water between all these islands, but 1½ miles west of Nosi Betaniazo is a rock, Frères bank, with 8 fathoms over it.

Scattered islets.—Tsara Bajina, the southernmost of the group, is 210 feet high; there are scattered rocks, above water, 7 cables N.W. of it. At 2 miles north of Tsara Bajina is Nosi Toloho, 240 feet high, and 3½ miles E.N.E. is Tsitamperina, 136 feet high, which has shoal water extending 5 cables S.E. of it; between them is Nosi Karabo, a low islet, 13 feet high, surrounded by reefs, and having a detached shoal, of less than 6 feet, lying 6 cables E.N.E. from it. At 1½ miles N. by E. from Tsitamperina is Nosi Antali, 215 feet high, and between this island and Nosi Mitsio is Nosi Kajohi, 110 feet high. At one mile west of Nosi Antali lie the two small islets Nosi Paso and Nosi Heji, 7 and 10 feet high, respectively, and surrounded by reefs and shoal water; at 2¼ miles W. by N. is Nosi Mavoni, 36 feet high. Shoal water extends from the south point of Nosi Mitsio to Nosi Kajohi.

Shoals.—Daphne rock is a small coral head, with 5 feet over it, lying 7 cables N. by E. from the north point of Tsara Bajina; there is deep water all round it. Two coral heads exist off the south point of Nosi Mitsio, one with 4½ fathoms over it, lying 6 cables west of the point; the other with 4¾ fathoms over it, at 1½ miles E.N.E. from the point.

General charts 758, 2762, 597, 748a, b.

Plan of Nosi Mitsio on 708. Var. 6° 20' W.

Marie reef, which dries 4 feet, is $2\frac{1}{2}$ miles S. 6° W. from Mitaraka point; Ampanitsoha reef, which dries 7 feet, is $1\frac{1}{2}$ miles S. 30° E., and Wash reef, whose existence is doubtful, is said to lie 5 cables S. 48° W. from the same point.

Castor shoal, discovered by the *Castor* in 1852, and (1902) examined by the French survey, has a least depth of $5\frac{1}{2}$ fathoms, rock, found at the northern end of the shoal, with Mount Ankarana bearing East distant $11\frac{6}{10}$ miles. From this position the shoal extends 5 cables S. $\frac{3}{4}$ W., and is 6 cables wide, with general depths of from $6\frac{1}{2}$ to 8 fathoms.

Dives bank (*Lat. 12° 46' S., Long. 48° 31' E.*), discovered in 1874, has a least depth of 7 fathoms, rock, with Mount Ankarana bearing S.E. $\frac{1}{4}$ E. and Nosi Betaniazo S. $\frac{3}{4}$ W., from which position the bank extends in a S.W. $\frac{1}{3}$ W. direction about 6 cables, with a width of 4 cables and general depths of 8 fathoms.

Ankarea bank, on which there is $6\frac{1}{2}$ fathoms rock, lies N. 34° W. distant 3 miles from Ankarea.

There are depths of from 15 to 30 fathoms eastward, and still greater depths westward, of these banks; but the large space between them and the two great Leven and Castor banks has been but very partially sounded, so caution is necessary when in this neighbourhood.

Plans 708 and 706.

Coast.—Between the Orontani peninsula and another peninsula terminating in, or rather separated from Nosi Fali by a very narrow channel, the northern extreme of that island lying about 52 miles S.S.W. $\frac{1}{4}$ W. from Cape St. Sebastian, the coastline recedes 21 miles, forming a large bay, in the middle of which and in line between the two points are the Minow islands, just described. There is anchorage in every part of this bay, the depth being moderate, the bottom sand, sandy mud, or mud; also, because the sea breeze is usually moderate and the water smooth, especially towards Ambaro bay, in the southern part, where the strong land wind from E.S.E. is least felt. The northern portion of this large bay, with its anchorages, has been already described at pages 347-352.

Plan 706, Pasindava and adjacent bays.

Ambaro bay is the southern bight of the larger bay; the point or peninsula enclosing it, with the exception of Ambato hill, is low. The anchorage is good except that it is quite open to the North, and there are several shoals in the bay, viz:—

Etuis bank, with only one foot over it at low water, and $4\frac{1}{4}$ fathoms half a mile outside, lies E. by S. a distance of $9\frac{1}{10}$ miles from Andilana point, the north-eastern extreme of Nosi Fali; Roche

General charts 758, 2762, 597, 748a, b.

Plan 706, Pasindava and adjacent bays. Var. 6° 50' W.

noir, N.W. by N. distant 5 miles, and Binao rock N.W. distant $3\frac{3}{4}$ miles from the one-foot rock, are shoals with 9 feet over them, and Kirota bank N.N.E. a distance of $4\frac{4}{10}$ miles from the same position is a shoal with 11 feet over it.

Nosi Fali (*Lat. 13° 19' S., Long. 48° 29' E.*), $5\frac{3}{4}$ miles long N. by W. and S. by E. with a greatest width of 2 miles at its northern and highest end, 223 feet, though generally low and marshy, is higher than the peninsula, from which it is separated by a narrow strait used by Arab boats laden with the rice produced on this fertile island. A reef extends nearly one mile from its northern end; and several reefs and $1\frac{1}{2}$ -fathoms patches lie from one to 2 miles off the eastern side.

NOSI BÉ, 24 miles south-westward of Nosi Mitsio, the largest island of the Minow group, is 14 miles in length North and South, by $9\frac{1}{2}$ miles East and West; its area is about 33,360 acres. It is about 6 miles from the coast of Madagascar, its southern point interposing between Nosi Fali on the East, and the peninsula, at the head of which is Dalrymple bay, on the West. The greater part of the island is volcanic, and several extinct craters are now transformed into ponds or small lakes. The highest point of the island is Mount Lokobé, at the south-eastern end, which is 1,487 feet in height; it is a granite peak with deep ravines, covered by a beautiful forest, except on its western side, where the rock is naked in consequence of the destruction of the wood by fire. No less than four other peaks, within less than a mile of Lokobé, rise to nearly the same height. The centre of the island is overlooked by hills also, of less height than Lokobé. Tanilatsaka peak, 1,100 feet high, on the western side of the island, has a conspicuous tree on the summit.

The British made a settlement at or near the present town of Hellville, about the year 1700, but soon abandoned it; and in the year 1840 the whole island was formally ceded to the French, who established themselves on the low land westward of the present site of Hellville, but suffering dreadfully from malarial fever, they removed to the higher present site. The inhabited and cultivated parts are near the coast, especially where the shore is sandy and suitable for landing and hauling up the native boats. The island generally is very fertile, but has hitherto been neglected, and labour is scarce. The rivers of Nosi Bé are simply rivulets, not navigable, but supplying cool limpid water.

Climate.—The temperature and climate of Nosi Bé are much the same as on the northern coast of Madagascar; but the island is not exempt from fever, which was unfortunately experienced by the first settlers, who, having established themselves on low marshy ground,

General charts 758, 2762, 597, 748a, b.

Plan 706, Pasindava and adjacent bays. Var. 6° 50' W.

lost 80 men out of 100 from fever and dysentery during the first twelve months; the survivors then removed from the valley to the higher ground farther eastward, with the best results. The rains on the island are heavier than on the neighbouring coast of Madagascar; the wettest months are from December to March, and for a period of 5 years, of a total annual rainfall of 90·1 inches, 66·2 inches fell during these months. The rains are heaviest and most frequent during the nights. The mean annual temperature for a period of 3 years was 80°, the mean maximum being 85°, and the mean minimum 75°; the mean barometric reading throughout the year is 29·9 inches. *See also Meteorological table in Appendix.*

Local winds.—When the S.W. monsoon prevails northward of the equator and the S.E. wind is permanent and strong off Cape Amber, from May to November the land and sea breezes are very regular. The land breeze (Tayot) commences early in the morning, a light breeze generally from S.E. or S.S.E., which dies away about 10 a.m., there is then an hour or two of calm, and the sea breeze (Varatraza) sets in about 1 p.m., blowing from the westward, and much stronger than the land breeze. The breeze dies away about 7 p.m., and it is generally calm all night. In the winter months the winds are very irregular. The land and sea breezes are often replaced by squalls. In the months of December, January, February, and March, there are daily squalls, and storms are very frequent.

Depths.—In the western approach to Hellville there are depths of from 13 to 20 fathoms; in the eastern approach there is 4½ fathoms, and in the south-eastern approach 6 to 10 fathoms.

SHOALS, &c.—WESTERN APPROACH to Hellville. — **Entrance bank** (*Lat. 13° 22' S., Long. 48° 1' E.*) is the first danger to be avoided in this approach; the least water on the bank is 3¾ fathoms, and the position lies 6¾ miles N.N.E. ¼ E. from Ankazoberavina or Passage island. The bank extends W.N.W. a distance of 3 miles, and S.W. a distance of 2 miles from this position, and has a depth of 5½ and 4½ fathoms on the edge, where it falls into deep water; north-eastward and eastward the bank continues for a considerable distance, with many shoal heads. At 3 miles S.E. ¾ E. from the 3¾ fathoms, on the western extreme of another bank, is a shoal of 2¾ fathoms, with 4¼ fathoms about 1¼ miles eastward of it.

Mount Lokobé, bearing East, leads to the southward of these banks. *Plan 706 and chart 758.*

La Tortue (New) bank, with a depth of 4¾ fathoms over it, lies N. by W. ¾ W. a distance of 6 miles from Nosi Fanihi.

Vert bank, with a least depth of 3¾ fathoms, near its northern edge, lies 2½ miles north-eastward from La Tortue, and another bank,

General charts 758, 2762, 597, 748a, b.

Plans 706 and 2871. Var. 7° W.

crescent-shaped, nearly 6 miles long, with depths of $5\frac{1}{2}$ and 6 fathoms over it, lies close north-eastward of Vert bank.

Pleiades (Dryad) shoal, with a depth of $4\frac{1}{2}$ fathoms, lies $9\frac{1}{2}$ miles West from Nosi Fanihi. All these banks and shoals, like Entrance bank, are close to the edge of the bank of soundings, and there are numerous other shoal heads and banks lying between them and Nosi Bé.

CAUTION.—Vessels should not attempt to pass between any of these outer banks or between them and Nosi Bé, and when passing the island on its western or northern sides, it should not be approached nearer than a distance of 11 miles.

EASTERN APPROACH.—Vessels having passed down by the in-shore passage from the northward, have only to keep a safe distance, say $1\frac{1}{2}$ miles, westward of Andembi point, the north-western extreme of Nosi Fali, and then steer S.S.W. $\frac{1}{2}$ W. for about 7 miles until abreast of Tafondro (Tafudru) point, the south-eastern extreme of Nosi Bé; when in the strait, $1\frac{1}{2}$ miles wide between that island and Nosi Komba, the following islands and dangers will confront them:—*Plan 2871, Nosi Bé, southern anchorages.*

Nosi Komba (*Lat. 13° 29' S., Long. 48° 21' E.*) itself, or Amberiovato, is nearly round, about 3 miles in diameter, and rises to a height of 2,035 feet, with another summit, Anketsabe, 1,790 feet in height and several more over 1,000 feet. It may be seen 35 or 40 miles distant. It is inhabited chiefly about the southern and south-eastern parts, is thickly wooded, and coal is said to have been found on it. Vanilla is now being planted. Ambarionaombi point, itself a small islet, is at the northern extreme of the island, and just eastward of it is the large village of Ampangorinana, where there is a sanatorium, as there is also at the summit of Anketsabe.

These sanatoria are well exposed to the wind, the climate is excellent, and the water very good. There is a road, but not fit for vehicles, between the two sanatoria.

A reef extends 4 cables north-eastward and 8 cables eastward from the point; in the latter direction are patches with from 7 feet to 3 fathoms and very irregular depths between; and, in the former, is Ambariomena islet, 17 feet high, with several rocks above water adjoining, and also several which dry from one to 8 feet at low water.

Ambariobé and Ambariotelo, or the Brothers, are islands on one reef lying north-eastward of Nosi Komba, upwards of a mile in length N.W. and S.E. by 4 cables wide, and its northern end is extended still farther westward by a shoal tongue with only $2\frac{1}{2}$ fathoms. The Brothers consist of several rocky islets, of which the most northern, 29 feet in height, is only 3 cables S. $\frac{3}{4}$ W. from Nosi Vorona. The channel between the shoals extending from the two

Plan 2871, Nosi Bé, southern anchorages. Var. 7° W.

islets is only $1\frac{1}{2}$ cables wide, with from $4\frac{1}{2}$ to 7 fathoms, and there is a 3-fathoms patch in the western part. It is not a passage to be taken at any time by a stranger.

Nosi Vorona or **Vauru**, is a small islet about 100 yards in diameter; it lies near the centre, but on the southern side, of a shallow bank 3 cables long East and West by $1\frac{1}{2}$ cables wide; eastward and northward of the islet, four other rocks dry on the same bank; and, westward of the islet, a bank extends 9 cables, with $3\frac{1}{2}$ fathoms at its extreme, and with many patches of from $2\frac{1}{4}$ to 3 fathoms on it.

LIGHT (*Lat. 13° 25' S., Long. 48° 22' E.*).—From a red shed, 27 feet high, on the highest part of the islet, is exhibited, at 54 feet above high water, a *fixed white* light, visible from a distance of 8 miles.

Tafondro point. — Shoal. — Buoy.—Tafondro point is well marked, rising to a height of 168 feet close to its extreme. From it, a shoal, drying some little distance out, runs off S.E. by E. a distance of 9 cables, with from $3\frac{3}{4}$ to $4\frac{3}{4}$ fathoms at its outer extreme, but with only a few feet over the greater part of it. A branch of this shoal extends 4 cables south-westward from the main body, with from one to 2 fathoms; and, at its south-western extreme, in about 5 fathoms, is moored a red conical buoy, with staff and globe.

Buoy.—The bay westward of Tafondro point is full of rocks and shallow flats; detached from them to the southward is a large flat with many patches of from 2 to 3 fathoms; at its south-eastern corner is another red conical buoy with staff and globe.

The channel in to Hellville from the eastward lies northward of Nosi Vorona and its shoals, and southward of the flats marked by the two red buoys, and is about $2\frac{1}{2}$ cables wide, but is not direct. Lokobé point bearing N. 89° W. leads through the first part, but directly towards the flats beyond; therefore, a vessel must haul sharply to the south-westward to clear them, the mark being the N.W. extreme of Nosi Fali in line with Tafondro point bearing N. 47° E. until Nosi Vorona bears N. 83° E.; then steer with that bearing preserved, astern, until abreast of Lokobé point and then for the anchorage off Hellville as desired.

CAUTION.—The buoyage in this vicinity cannot be implicitly trusted. Buoys are frequently shifted or abolished, and often reported out of position.

South-eastern approach.—The passage southward of Nosi Komba is 2 miles wide between it and the Madagascar coast and is practicable for the largest vessels, for which there is anchorage in case of need, avoiding a $2\frac{3}{4}$ -fathoms shoal about 8 cables off the south-eastern point of the island; also the Vatu Ranu rock or islet, 46 feet high, S.S.E. distant $1\frac{1}{4}$ miles from the same point, which has shoal

General charts 758, 2762, 597, 748a, b.

Plan 2871, Nosi Bé, southern anchorages. Var. 7° W.

ground of $2\frac{1}{2}$ fathoms extending about 3 cables northward and $1\frac{1}{4}$ miles westward from it. On rounding the southern side of Nosi Komba, and keeping about a mile from its coast, the Great road may be steered for direct.

Tani-Keli or Ninepin island is nearly square, about $2\frac{1}{2}$ cables in extent, covered with trees, and bordered by rocks which extend from it about $1\frac{1}{2}$ cables; it may be safely approached within half a mile in all directions. The rock which gives it the name of Tani-Keli or Ninepin is on the north-western side, and does not show when in line with the island. In a small niche in this rock, when examined by Capt. Owen, a Malagasy coffin was found.

LIGHT (*Lat. 13° 29' S., Long. 48° 15' E.*).—On the summit of the islet, in a lighthouse 26 feet high, is exhibited, at an elevation of 197 feet above high water, a *group flashing white* light, showing two groups of *three flashes*. The light is visible in clear weather from a distance of 21 miles.

Héloise bank, of coral, scarcely one cable in extent, with $4\frac{1}{4}$ fathoms over and from 8 to 10 fathoms close around it, lies nearly midway between Nosi Komba and Tani-Keli, with the North and N.W. points of the former in line, and E. $\frac{1}{2}$ S. $2\frac{2}{10}$ miles distant from the lighthouse on the latter.

HELLVILLE BAY and GREAT ROAD.—In the southern end of Nosi Bé, between Mahatinzo and Lokobé points, 3 miles apart on a W. by N. $\frac{1}{2}$ N. and E. by S. $\frac{1}{2}$ S. line of bearing, the coast recedes about one mile, and forms three bays, of which Hellville bay is the most western, Plateau cove forms the centre, and Ambanoro bay is the eastern inlet. The open space between the points and fronting these bays is known as the Great road, and the general depth in that space is from 12 to 8 fathoms, mud, with occasional patches of coral and sand. In either of the bays, a vessel is sufficiently secure to refit; the greatest fetch being from the South, out of Pasindava bay, except with the wind one or two points southward of West, and when strong from that quarter a swell rolls in making it difficult to land on the beach.

Hellville, of which the native name is Antsirambazaha, is the principal town on the island, and was named after a French admiral; it is also the capital of the province of Nosi Bé, which had in 1910 a population of 32,483, of whom 495 were Europeans and assimilated, and 462 Asiatics or Africans; it is built on the little promontory which separates Hellville bay from Plateau cove, and being on fairly high ground is not unhealthy. The detached gardens and houses around the town, as well as the broad roads, give it a refreshing air of civilisation. Numbers of Indians have settled in the town of Ambanoro, which is situated about 3 miles

General charts 758, 2762, 597, 748a, b.

Plan 2871, Nosi Bé, southern anchorages. Var. 7° W.

from Hellville; this small town is the scene of great activity, as it is the great commercial place of the island, and the Indians have built themselves here many fine stone houses. Extending from the south-eastern point of Hellville 275 yards E. by S. $\frac{1}{2}$ S. is a mole, 20 feet wide, protecting the western side of Plateau cove from the swell, including an inner creek formed by a rivulet which flows into the cove. A cluster of rocks about 15 yards in diameter, with only 7 feet water, lies about 65 yards from the end of and in the same line as the mole. The greater part of the enclosed space dries from 2 to 5 feet at low water.

Near the Governor's house, on rising ground within the mole, is a flagstaff; the Custom-house is also just within the mole.

Reef.—Buoy.—A reef, taking as its base the whole frontage of the town of Hellville, including the mole, extends southward in the shape of a triangle, of which the apex, with only 4 feet water, lies $4\frac{1}{2}$ cables from the shore and close to the 10-fathoms edge of soundings; here it is marked by a black conical buoy with staff and globe, in about 10 fathoms.

Many parts of this shoal dry at low water, and the remainder is only covered by a few feet.

A mooring buoy for the use of the steamers of the Messageries Maritimes lies in about 7 fathoms in the entrance of Plateau cove, about $1\frac{1}{2}$ cables south-eastward from the mole head.

Plateau cove and Ambanoro bay are divided by a small promontory, on the eastern side of which is a German factory and quay. At the head of this bay is a large village, from which a pier runs out in a shallow channel through the reefs by which the whole bay is occupied, there being in the very centre, slightly detached from the rest, a $2\frac{1}{4}$ -fathoms patch, immediately outside of which the bottom becomes clean with depths of 8 and 9 fathoms.

Mahatinzo point, on the western side of Hellville bay, has a white signal staff and lookout station, 420 feet above the sea; the approach of a vessel is reported by the hoisting of a ball below a pendant. A reef, with only 4 feet close to its edge and dropping suddenly to 10 fathoms, runs off $2\frac{1}{2}$ cables to the southward from this point, and is not marked in any way.

Harbour light (*Lat. 13° 24' S., Long. 48° 18' E.*).—At Hellville mole head, in Plateau cove, from a red lantern and fittings on a white stone base, a *fixed red* light is exhibited, visible from a distance of about 3 miles.

Plans 706 and 2871.

Directions.—The western entrance to the Great road and also to Pasindava bay is a clear channel 5 miles wide, between Ankazobervina island and Entrance shoal. A large vessel from the southward

General charts 758, 2762, 597, 748a, b.

Plans 706 and 2871. Var. 7° W.

should pass about 2 miles outside Nosi Iranja, steering N.E. by N. until Ankazoberavina island bears E. by S. $\frac{1}{2}$ S., and Mount Lokobé will then bear about East; Mount Loboké kept on this bearing will lead through the channel and southward of Entrance shoals; when inside these steer for the anchorage desired. Nosi Komba and Tani-Keli are good landmarks by which to enter the bay. No further directions are required for the Eastern passage than those already given in the description of that passage at page 360.

Anchorage.—Vessels from the northward, having passed along the eastern side of Nosi Bé, may anchor in 9 or 10 fathoms about 3 miles north-eastward of Nosi Komba, or farther southward off the eastern side of that island, where they will, if required, find a pilot to conduct them to Hellville. The south-eastern part of Tsimipaika (Marobakoli) bay, the bight south-eastward of Nosi Komba, is so shallow that the smallest boat cannot approach within one or 2 miles of the shore, excepting through narrow and intricate channels.

Vessels may anchor anywhere along the southern coast of Nosi Bé westward of Nosi Komba, in from 13 to 7 or 8 fathoms, protected from all but westerly winds. The bottom in nearly every part is mud, or muddy sand, good holding ground.

Off Plateau cove (*Lat. 13° 25' S., Long. 48° 18' E.*), the northern central part of the Great road, is the anchorage chiefly used, the depth being from 6 to 9 or 10 fathoms. Small vessels can go close in northward of the mooring buoy, but in this case they must lie moored; large vessels must keep outside the mooring buoy and not interfere with the berthing of a vessel at that buoy.

The anchorage in Hellville bay is not so convenient as that off Plateau cove, as boats are obliged to pass round the shoal to reach the landing-place, but it is more sheltered from the sea breeze and the water is smooth.

Coasting vessels often lie in Ambanoro bay, in from 5 to 9 fathoms; vessels requiring water, anchor off the watering place on the eastern side of the Great road, 4 cables off Pasindava village, in 10 fathoms, mud.

Pilots.—Native pilots, under the Harbour Master's authority, are available, and it is customary to employ them in conformity with the regulations of the port.

Quarantine, &c.—Quarantine regulations are enforced, and all vessels must receive pratique before communicating with the shore. The principal climatic disease is malarial fever. There is a government hospital.

Plan 2871, Nosi Bé, southern anchorages. Var. 7° W.

Tides.—Tidal streams.—It is high water, full and change, in Hellville road, at 4h. 38m.; springs rise 13 feet, neaps 9 feet above the level of the soundings on the chart, which soundings are about $1\frac{1}{2}$ feet below the level of low water, ordinary springs. The flood stream sets eastward and the ebb westward at from half to $1\frac{1}{2}$ knots, and in the channels, north and south of Nosi Komba it attains a rate of $2\frac{1}{2}$ knots at springs. In the eastern entrance channel the streams appear to turn from one to 2 hours before high and low water at Hellville.

Trade. — Communication. — The main line Messagerie steamers call here twice a month. The branch line steamer between Diego Suarez and Zanzibar call on the 15th or 16th of the month, outward bound, and the 4th or 5th of the month, returning. The Havre Peninsula steamers also call twice a month, and the German East African line steamers frequently. Hellville is an important centre of trade, as it is the starting point of the coasting trade with the smaller western ports, carried on mainly by small sailing vessels. The trade along this coast as far as Majunga is chiefly in the hands of Indians, who deal in British and German goods, and Bombay textiles, and every year in the month of December numbers of sailing vessels arrive from Bombay. Two important German trading firms are established here.

In 1910 the total value of imports was £123,146, and exports £149,282; the total number of vessels that entered the port was 1,203, of a total tonnage of 173,667 tons.

Supplies.—Coal.—Beef is always to be had, but the bullocks are small. Poultry, yams, sweet potatoes, plantains, and other vegetables are plentiful and of good quality. The bay abounds in fish. There is no large timber for building or masting, nor any facilities for repairing a vessel below the water line. The French government keep a stock of about 1,400 tons of lump coal and patent fuel, but there is no private dépôt.

Water is obtained from a pipe at the mole head, on application at the Port Office. Gunboats haul their sterns in towards the mole, and connect a hose direct with the pipe. A copious supply of pure clear water may be had, as previously explained, from a mountain stream close to Pasindava village.

SMALL PORTS and anchorages in NOSI BÉ.—**Crater bay (Amborinirona)** (*Lat. 38° 24' S., Long. 48° 14' E.*) is 2 miles westward of Mahatinzo point; or rather beyond a ledge of rocks, shingle, and sand, which extends $1\frac{3}{4}$ miles from the point and land westward of it, and partially uncovers at low water.

Crater or Ambatotomboka point forms the western side of the bay, and has a hole through it. Under favourable circumstances of

General charts 758, 2762, 597, 748a, b.

Plan 2871, Nosi Bé, southern anchorages. Var. 7° W.

weather, the crater may be entered on its south-western side, at high water, by a boat, and within there is a depth of $3\frac{1}{4}$ fathoms. About 7 cables S. $\frac{1}{2}$ W. from Crater point is the Suzi bank with a least depth of 5 fathoms.

The anchorage ground is nearly a mile wide, and the bay recedes about 5 cables, the depth being from 5 to 9 fathoms. The best shelter is on the western side under cover of Crater point, but avoiding a spit which runs into the bay in a north-easterly direction with a rock which dries 2 feet near its end. Small vessels may even take shelter inside and north-westward of this spit in $3\frac{3}{4}$ fathoms, mud.

Nosi Tanga is a small islet 151 feet high about 3 miles north-westward of Crater point and on the edge of the shore reef. Ambondro rock, a dangerous rock, barely covered at lowest tides, lies $6\frac{3}{4}$ cables S. by W. $\frac{3}{4}$ W. from its summit; between it and Crater point are two small bays choked by reefs extending from 4 to 5 cables off-shore, and, again, between it and Sakatia, 3 miles farther northward, the coast is lined with rocks, extending in one place more than 2 miles off-shore, with only 2 fathoms over them.

Plan 706, Pasindava and adjacent bays.

Sakatia island (*Lat. 13° 18' S., Long. 48° 11' E.*), off the western side of Nosi Bé, is 318 feet high, and more than 2 miles in length N.E. and S.W. by one in breadth; it must be approached with caution, but its shores are clear, except on the northern side and on part of the eastern side, where it approaches Nosi Bé. There is good anchorage on the south-eastern side, close to its shore, in from 9 to 11 fathoms, muddy clay, sheltered from all winds, except those from West and South-west, which rarely blow.

The leper asylum is on Sakatia.

Andilah bank.—Off Misaubsi point is a large $3\frac{1}{4}$ -fathoms shoal on which the sea always breaks, and there are numerous other shoals northward and westward. *See* pages 358, 359.

Fotaka bay (Béfotaka), on the north-western side of Nosi Bé and north-eastward of Misaubsi peninsula, is about 3 miles wide and recedes a similar distance, its entrance being partly obstructed by rocks and shoals; within, there is a clear space with from 8 to 11 fathoms, about the centre of the bay, but the sea breeze is usually very fresh about this part of the island, and, coming from N.W. into the open bay, it causes a disagreeable swell, and this anchorage is not recommended.

Soa rock, with 4 feet of water, lies $1\frac{1}{2}$ miles south-westward of Tanjona point, the north-eastern point of Fotaka bay. This rock is probably identical with that reported by H.M.S. *Lily* in 1842, a mile farther up the bay, and marked as of doubtful existence. At $1\frac{3}{4}$ miles

General charts 758, 706, 2762, 597, 748a, b.

Plan 706, Pasindava and adjacent bays. Var. 7° W.

westward of Soa rock is Guibert rock, with 5 feet, and situated on a coral bank of irregular form, with from $5\frac{1}{4}$ to $7\frac{1}{2}$ fathoms; it is about one mile northward of Antsoiheri rock, above water, and that rock is joined to the shore southward of it by a shoal.

Nosi Fanihi and Erdwin bank.—Nosi Fanihi is 124 feet high, and appears nearly square, standing $1\frac{1}{2}$ miles off the northern end of Nosi Bé; it is clear of danger on the western side, but there are rocks off its northern end, and a bank extends from its south-eastern side about 4 cables. There are from 7 to 11 fathoms generally in the channel between it and Nosi Bé, but a 4-foot coral bank lies in the centre of the northern part of the passage. There is also on the Erdwin bank, which is $1\frac{1}{2}$ miles long and 5 cables wide, a 5-foot patch at $2\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from Nosi Fanihi, and $2\frac{1}{4}$ miles N.W. by N. from Ampahofaho point; this patch is in the middle of the northern side of Erdwin bank, over the remainder of which the depths are only from $1\frac{3}{4}$ to $2\frac{1}{2}$ fathoms.

N.E. rock is $1\frac{1}{2}$ miles East from Ampahofaho point; it is 6 feet high, and marks the south-eastern edge of a bank extending $1\frac{3}{4}$ miles northward and one mile westward of the rock, on which bank the general depth is $3\frac{1}{2}$ fathoms, except on one patch, which dries 4 feet 7 cables northward of N.E. rock. Between the bank and the point, there are from $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms.

Tendraka bay, on the north-eastern side of Nosi Bé, is divided into two parts by a point, close off which is an island of the same name covered with trees, from which people can walk on shore. The bay on the northern side of Tendraka island offers good anchorage in from 7 to 9 fathoms, a little outside a line drawn from that island to the northern point of the bay. Just within that line, at 8 cables North a little easterly from the eastern extreme of Tendraka island is Larras rock with only 3 feet over it. The village on the western side of the bay is difficult of access and useless for supplies.

The greater part of the creek on the southern side of the island dries at low water; on the southern point is a village where fowls may be procured.

Linta bay (*Lat. 13° 18' S., Long. 48° 21' E.*) is near the centre of the eastern coast of Nosi Bé; its shores are lined with shoals which dry a great distance out, and on the northern side the reef extends more than a mile off-shore. Black rock is at the inner part of the bay, on the edge of the reef, and 21 feet high.

The anchorage is opposite the centre of the bay, in 6 or 7 fathoms, mud or muddy sand; the depth decreases suddenly, and there is generally a swell setting in. Communication with the shore is difficult

General charts 758, 2762, 597, 748a, b.

Plan 2871, Nosi Bé, southern anchorages. Var. 7° W.

except at high water, neither is it easy to procure fresh water; small supplies of fresh provisions may be purchased at the village.

Ambato Zavavi bay is the southernmost and least serviceable of the three bays on the eastern side of Nosi Bé; it appears spacious, but one-third of its area, of sand and coral, dries at low water. The anchorage is opposite the centre, about in line between the two points, in from 7 to $5\frac{1}{2}$ fathoms, soft mud. The sea breeze is not felt in that position, but easterly winds are dangerous.

Plan 706, Pasindava and adjacent bays.

PASINDAVA BAY, southward of Nosi Bé, is the broad and deep indenture in the Madagascar coast enclosed on its western side by a promontory on which are many peaks varying from 1,900 to 2,464 feet above the sea, the latter height being the highest of the two peaks of Mount Ambohimirahavavi or the Two Sisters.

On the eastern and southern sides of the bay are mountains of greater height; amongst others, the stupendous and inaccessible peak of Mataola, 5,000 feet high and 50 miles distant, but lofty as it is, scarcely rising above the broader summits of its gigantic neighbours. In consequence of the variety of chasms and inaccessible steeps, of which this chaotic mass is composed, it presents a grand appearance; it is of volcanic formation, and earthquakes are said to be frequent. Storms generated on those highlands, descend the ravines, blowing over the low ground in violent squalls.

Pasindava bay is about 15 miles wide at the entrance, and recedes 18 miles to the southward; at the head stands the town of Mailaka or Ampasindava. The depth at the entrance is from 23 to 13 fathoms, the deepest water being on the western side, and decreasing irregularly to 6 and 4 fathoms at 2 miles off the town, where it becomes very shallow.

SHOALS.—**Antaimpitili shoal**, with $2\frac{1}{2}$ fathoms least water, and coral bottom, lies with the rock off Ankifi point bearing E. $\frac{3}{4}$ S. distant $2\frac{1}{2}$ miles. From the shoalest spot, the bank extends 150 yards W. by S., and about 100 yards S. by E.

A 5-fathoms bank of coral, covered with black sand, lies with the rock off Ankifi point bearing S.E. by E. distant 2 miles.

Tuareg shoal (*Lat. 13° 32' S., Long. 48° 16' E.*), on which a vessel of that name touched in 1884, consists of several coral heads lying in a N.W. by W. and S.E. by E. direction, the shoalest head, of 6 feet, being on the north-eastern side; from it, Tani-Keli lighthouse bears N. by W. $\frac{1}{4}$ W. distant $3\frac{1}{2}$ miles. From the shoalest spot, a

General charts 758, 2762, 597, 748a, b.

Plan 706, Pasindava and adjacent bays. Var. 7° W.

9-foot head lies upwards of 100 yards S.E. by S., and another head with $4\frac{1}{2}$ fathoms lies N.W. by W. $3\frac{1}{2}$ cables.

S.S.E. $\frac{1}{2}$ E. a distance of about 2 miles from Tuareg shoal is a shoal with $4\frac{1}{2}$ fathoms over it, and S.S.W. $\frac{1}{2}$ W. a distance of about $2\frac{1}{2}$ miles is one with $6\frac{1}{2}$ fathoms over it.

Anchorage.—The large bay of Pasindava is too open to afford shelter, but secure anchorage may be found at Kisimani, and within Nosi Mamoko. In 1881, the *Seagull* anchored 6 or 7 cables off-shore in the upper part of the bay in 5 fathoms, mud, with the eastern extreme of Nosi Mamoko N. 16° W., and the northern extreme of Ambodimadiro S. 35° E.

Plan of Nosi Mamoko anchorage on 706.

Nosi Mamoko or **Amberio Telo**, on the western side of Pasindava bay, and bearing E. by N. from the peaks of Ambohimirahavavi, is separated from the mainland by a clear space from 3 to 5 cables wide, with depths of from 4 to 8 fathoms, where vessels are sheltered from all winds. The island, with its fringing reef, is about $8\frac{1}{2}$ cables in length North and South, 302 feet high, and covered with trees; it has a creek on the western side, where a vessel might be careened. The reef extends about 2 cables from the northern end; the southern and western parts are almost clear of reef.

The group of islands and rocks to the northward, separated from Nosi Mamoko by a clear deep channel $2\frac{1}{2}$ cables wide, is surrounded by a reef which nearly unites with the shore at the northern end, leaving in that direction two very narrow but deep passages.

Anchorage.—The best berth and easiest of access is that westward of Mamoko, which may be reached by either the northern or southern channel round that island, anchoring abreast of its centre in from 6 to 8 fathoms, mud; or a vessel may anchor off the southern entrance in about 9 fathoms. There is also good anchorage within the northern islets and reef in 7 fathoms.

Water may be obtained at all seasons from either of the two streams opposite the islands, but the supply is scanty during the dry season. One stream is nearly abreast the northern end of the reef, the other is in a bight $1\frac{1}{4}$ miles westward from Mamoko.

Plan of Kisimani anchorage on 706.

Kisimani anchorage (Ambararata bay) (Lat. $13^\circ 34'$ S., Long. $48^\circ 6'$ E.).—This anchorage is also on the western side of Pasindava bay and near the entrance; the island and reef form a snug natural harbour. Maropopango cove on the western side of Kisimani anchorage is a beautiful enclosed basin, surrounded by woods, with a depth of from 2 to 5 fathoms. Opposite the northern end of Nosi

General charts 758, 2762, 597, 748a, b.

Plan of Kisimani anchorage on 706. Var. 7° W.

Kisimani is a village with a flagstaff. The River Kingoni, a shallow insignificant stream, flows into the southern part of the harbour.

Anchorage may be taken up soon after passing between the island and the opposite point, both of which are bordered with reefs; the depth is from 11 to 6 fathoms, mud, and good holding ground. As the entrance is very narrow, before entering, a boat should be anchored on the edge of the reef extending from the point on the starboard hand.

Supplies.—At this place as well as at Mamoko and several other villages on the western side, and also at the head of the bay, oxen may be had in abundance at moderate prices; also fowls, wood, and water, but no vegetables. Fish may be caught with the seine, and there is good shooting in any direction round the harbour.

Local winds.—In Pasindava bay, the wind is usually light from E.S.E. or S.E. during the early morning, but ceasing about 8 a.m. to recommence a little later at South, inclining to S.W. This period of light breeze or calm is succeeded about 1 p.m. by the sea breeze, which may be fresh, but never strong; this blows from about West until nightfall, when it becomes light, veers to N.W. and North, and then dies away to a calm. At about one hour after nightfall, a light land breeze arises, variable in direction, and continues until the morning. It is thought that the land breeze is strongest at the times of full and change of the moon.

Plan 707, Ambaratobi bay.

AMBAVATOBI or Dalrymple bay (*Lat. 15° 32' S., Long. 48° 1' E.*).—This bay is at the northern extreme of the peninsula which forms the western side of Pasindava bay, and its entrance is 14 miles south-westward of Nosi Bé; it is capable of containing a large squadron. Ambavatobi peninsula appears from a distance like a cluster of islands. The entrance of the bay is open to the northward, and from a distance may be recognised by two high mountains of greyish colour, which in one view present a double peak. A spur of the mountains forms Makambi and Marovitsikia points on the eastern side, from which a fringing reef extends westward $1\frac{1}{2}$ cables and northward 5 cables, continuing along the coast to the eastward for 3 miles, but then diminishing to half that width at Ampoahana point. Antsiraka point, on the western side, is bounded by a narrow fringing reef which extends about half a cable from the eastern extreme into the passage, and continues north-westward, increasing in width towards Angadoka point.

The bay is divided into three smaller bays, Anda-si Bé bay being the western, Amboahangi the eastern, and Androfiabe the southern.

General charts 758, 2762, 597, 748a, b.

Plan 707, Ambavatobi bay. Var. 7° W.

Inside Antsiraka point is the principal village, Andassi Bé, where there are two flagstaffs, and there is another flagstaff on the coast hill southward of the village.

The entrance to Ambavatobi bay is 7 cables wide, but its navigable width between the 5-fathoms contour lines is only 2 cables. On the leading line, the depression between the peaks of Ambolimira-havavi (the Two Sisters) over the low point of Marolai, S. 10° E. (*see* view on plan), there is a least depth of 12 fathoms until well inside the entrance.

Shoals.—Dalrymple rock, awash at low water, lies 3 cables N.N.W. from Amboaboaka point. There are two detached patches of 2 $\frac{3}{4}$ fathoms in Amboahangi bay, one south-westward of Maques point and the other north-eastward of Ile Verte. Shoal water also extends 2 cables S.S.W. from Antsiraka point. Besides these shoals there are many other shoals and detached reefs, but they all extend from the coasts on the southern side of the eastern and western bays, and not far enough to interfere with the anchorage.

Anchorage (*Lat. 13° 33' S., Long. 48° 0' E.*).—The western bay is generally recommended as an anchorage, and a vessel may refit there in safety; but the eastern bay has the advantage of a stronger sea breeze, and is more free from sandflies and mosquitos than the western bay. In both bays there is a large available space, with depths of from 6 to 9 fathoms, mud, or sand and mud.

The southern bay has a much more confined space, available for anchorage, than the other two bays, and there are patches of 4 and 4 $\frac{3}{4}$ fathoms across the entrance.

Tides.—It is high water, full and change, at Ambavatobi bay at 4h. 38m.; springs rise 13 feet; neaps 9 feet above the level of the soundings on the chart, which soundings are about 1 $\frac{1}{2}$ feet below the level of ordinary springs. The tidal stream is only felt at the entrance.

Supplies.—Beef can be procured cheaply in abundance. Fowls, ducks, geese, eggs, milk, sweet potatoes, a few other vegetables, and indifferent bananas are obtainable from Andassi Bé village; but vegetables and fruit are sometimes scarce and dear. Guinea-fowls abound on the hills, but are very wild; the natives trap them. Fish are abundant, but there is only one suitable place for hauling the seine and that is southward of Makambi point.

Coal mine.—Before the reign of Radama II. coal was found at Amboaboaka, and an attempt was made to work it, but the establishment was destroyed during a war prior to 1890.

Water can be obtained on the western side, from a spring 300 or 400 yards from the beach.

General charts 758, 2762, 597, 748a, b.

Plan 707, Ambavatobi bay. Var. 7° W.

The trees round the harbour have been greatly reduced by fire, in clearing the ground for growing rice. They have also suffered much through the burning of the dry grass annually in October; many large trees stand bleached white, dead, and leafless, their stems being deeply charred some feet above the ground.

Ankazoberavina or Passage island (*Lat. 13° 29' S., Long. 47° 59' E.*) is one mile N. by E. from Angadoka point, which is the northern extreme of Ambavatobi peninsula; it is 4 cables long North and South, and the same distance in width; it is 204 feet high, and covered with brushwood. When seen from the S.W., it appears in two parts, but from a distance north-westward it shows as one hummock. It is surrounded by a small fringing reef, principally on its western side, but it may be passed at a little over 2 cables even on that side. There is a passage 4 cables wide between the island and Angadoka point, but in the middle is a coral bank, nearly $2\frac{1}{2}$ cables long, with depths of $4\frac{1}{2}$ to 5 fathoms over it.

Chart 705, Pasindava bay to Nosi Shaba.

Nosi Kivinji is $1\frac{1}{2}$ miles south-westward from Ankazoberavina, and $1\frac{1}{10}$ miles W. by N. from the northern extreme of Angadoka point; it is a cone 338 feet high, with perpendicular sides and brushwood on the inaccessible summit. It presents a light colour towards the West, and is very conspicuous from that direction, being also higher than adjacent objects.

Nosi Antsoha is 207 feet high, more than half a mile south-eastward of Kivinji, and less than half a mile from the western side of Angadoka point. Between the two islets there is a passage about 3 cables wide with from 6 to 12 fathoms; the side nearest to Kivinji is preferable, as a 4-fathoms spit runs off to the northward of Antsoha. The space between Antsoha and the point is closed by a shallow reef.

In the sandy bay south-eastward of Antsoha, there is a small village where cattle and poultry may be quickly procured at a moderate price.

General charts 758, 2762, 597, 748a, b.

CHAPTER IX.

MADAGASCAR, N.W. COAST.—AMBAVATOBI BAY TO CAPE
ST. ANDREW.

(*Lat. 15° 20' S. to Lat. 16° 10' S.*)

(*Long. 48° 10' E. to Long. 44° 0' E.*)

Variation in 1911.—Decreasing 7' to 8' annually.

Chart 758, Cape St. Andrew to Antongil bay.

GENERAL REMARKS.—From the northern extreme of the Ambavatobi peninsula, Cape St. Andrew bears about S. 60° W., and is distant 262 miles, the coast between forming a bay receding at its centre about 43 miles from that line, and itself containing several of the most important bays and harbours in Madagascar, such as Narendri, Mahajamba, and Bombetoke, all of which are growing in importance since the French occupation of the island.

Winds.—Of the winds on the coast comprised within this chapter, Messieurs Mion and Driencourt, of the French Hydrographic department, have given much information, from which the following is summarised. During the dry season, *i.e.*, from April to November, the S.E. monsoon makes itself felt at night and in the morning. It often becomes fresh and attains its maximum strength about 8 a.m., then decreasing and dying away about noon. At the beginning of the season, it sometimes lasts during the afternoon, and indeed continues for two or three days. Usually, however, about 1 or 2 p.m., the wind springs up suddenly from N.W., and so continues until after nightfall. As the season advances, this sea breeze increases in strength, occasionally destroying the S.E. monsoon altogether; there are then a few mornings of calm.

During the rainy season, the monsoon scarcely exists, the mornings are nearly always calm; the N.W. wind (sea breeze) often sets in before noon, and is generally stronger than during the dry season. Sometimes clouds gather over the land in the S.E., and suddenly the wind blows from that direction in squalls, accompanied by heavy rains, lightning, and thunder.

Off the coast, between Narendri and Mahajamba, during the dry season, the S.E. monsoon, rushing through the gorges of the two bays,

General charts 2762, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 7° W.

and of the mountains dividing them, blows with the greatest strength; and, as at this part, vessels bound from Nosi Bé southward are at their greatest distance from the land, they encounter a high sea. For this reason, many vessels make their passages inside the reefs, keeping near the coast.

Chart 705, Pasindava bay to Nosi Shaba.

Iranja islands.—Proceeding with the description of the western coast of the Ambavatobi peninsula, and its adjacent islands and shoals, from the point at which it was left at the conclusion of the last chapter, the Iranja islands first claim attention. They are two in number, and are on the bank of soundings at 11 miles S.W. by W. $\frac{3}{4}$ W. from Ankazoberavina island, the outer and largest island being $4\frac{3}{4}$ miles, and the smallest $3\frac{1}{2}$ miles from the nearest part of the coast. On the western side of the islands shoal water extends for a distance of $1\frac{1}{2}$ miles, and a narrow bank runs N.E. for a distance of 9 miles, and S.W. for a distance of 18 miles; there are several patches of from $4\frac{1}{2}$ to 5 fathoms on this bank.

Nosi Iranja, the larger island, is of very irregular form, and less than one mile in extent in any direction; it is 207 feet high, and appears as two islets when seen from the northward, the western end being lower than the eastern; the latter is a cliff, and its summit is covered with grass and a few trees; the northern end is bare and red; there is also a narrow red strip of rock in the centre and at the summit. The southern island is sandy and thickly wooded; it is connected with Nosi Iranja by a reef which covers at high water. When seen from a distance to the westward, the small detached rock Ambatomilai, 34 feet high, appears between the two islands, and is like a boat under sail.

LIGHT (*Lat. $13^{\circ} 35'$ S., Long. $47^{\circ} 50'$ E.*).—Near the centre of Nosi Iranja, from a metal tower, 59 feet high, with black and white bands, is exhibited, at an elevation of 221 feet above high water, a *flashing white light every five seconds*. The light is visible in clear weather from a distance of 20 miles.

Water.—There is fresh water on the smaller island, and it is said that a small quantity may be found on the northern part of the larger island.

Shoals.—A bank with from $3\frac{1}{2}$ to 4 fathoms lies between the islands and the shore, $1\frac{1}{2}$ miles eastward of the southern island; this bank is $1\frac{1}{4}$ miles long North and South, 3 cables wide, and between it and the mainland is a channel having from 7 to 10 or 12 fathoms water. At $4\frac{1}{2}$ miles S. by E. from the southern island is a small shoal with 3 feet water; less than 5 cables eastward of this, is another small $2\frac{1}{2}$ -fathoms shoal. These two shoals lie north-westward of the River

Chart 705, Pasindava bay to Nosi Shaba. Var. 7° W.

Baramahamai, at from one to 2 miles from the coast; both are of coral, and there is a depth of 14 fathoms between them, from 8 to 11 fathoms between them and the shore, and near them in all other directions, from 13 to 16 fathoms.

Vestal reef.—In 1878, H.M.S. *Vestal* touched on a coral reef of considerable extent, of which the outer north-western part dries at low water and is 2 miles from Komameri point, the nearest coast.

From the northern part of the Vestal reef, the southern Iranja island bears N. $\frac{3}{4}$ E., and is distant $8\frac{1}{2}$ miles. From this part, in an E. $\frac{1}{2}$ S. direction, and nearly midway between it and the mainland, is a shoal of from $2\frac{3}{4}$ to $3\frac{1}{2}$ fathoms, nearly one mile in extent N.N.W. and S.S.E. Many other shoals lie between the Vestal reef and Kalakajôro, consisting generally of coral patches with less than 4 or 5 fathoms, and in one case of only 4 feet, and extending almost to the bank, running south-westward from Nosi Iranja, for an intelligent comprehension of which the seaman is referred to the chart. *See also Caution, on next page.*

Kakambana bay (*Lat. 13° 35' S., Long. 47° 56' E.*).—This bay lies between Andrahibo point, a narrow tongue of land extending in a westerly direction, having on it three hillocks covered with trees, and Antangena point, $2\frac{1}{2}$ miles W. by S. $\frac{1}{2}$ S. from it. Coral reefs, not visible at high water, extend 6 cables seaward from Andrahibo point, and also project that distance from the southern shore of the bay eastward of Antangena point, thus greatly reducing the space available for anchorage, which, to ensure a depth of from $3\frac{1}{2}$ to 6 $\frac{1}{2}$ fathoms, does not exceed $1\frac{1}{2}$ miles in length by 4 cables in width. The southern part and head of the bay are very shallow, several heads of coral within the edge of the fringing reef being awash at low water.

Anchorage.—The best anchorage is about S. by E., distant 5 cables from Andrahibo northern point in $3\frac{1}{2}$ fathoms, sandy clay, and good holding ground; protected on all sides except from the North-west.

The River Kakambana flows into the head of this bay; the entrance is blocked by rocks, and it is only navigable by boats at high water. There are many villages round the shores of the bay, the most important is Morotonge, on the southern side.

Coast.—Southward of Kakambana bay are hillocks nearly covered with trees showing patches of bright red. About 5 miles inland is the massive mountain Andrano Miserano, entirely covered with trees, its summit 2,244 feet above the sea. This, with the summits of Ambohimirahavavi or the Two Sisters, previously described, and Porte mount or Berahodo, 5 miles inland from the head of Rafaralahi bay and

General charts 758, 2762, 597, 748a, b.

Chart 705, Pasindava bay to Nosi Shaba. Var. 7° 10' W.

2,306 feet high, mark the northern termination of a chain of mountains, and make good landmarks, visible 60 miles in clear weather.

The village Soroni is nearly opposite the Iranja islands.

Baramahamai creek and river.—The small creek into which this river flows is $7\frac{1}{2}$ miles southward of Antangena point, and may be known by the sudden break in the coastline. Another stream, the Tetezambato, flows into its head, $2\frac{1}{2}$ miles from the sea, from the north-eastward. The creek is, in fact, nothing more than the mouth of both rivers, and is open to the westward; in 1883, the *Boursaint* and the *Pique* anchored in front of the village, where there is a flagstaff, which lies about a mile within the entrance on the southern shore, when the former had not room to swing. The general depths for $1\frac{1}{2}$ miles within the entrance in the narrow central channel are from $3\frac{1}{4}$ to $6\frac{1}{2}$ fathoms, and there is room for one vessel northward of the village, in 6 fathoms; boats may ascend either river.

RADAMA ISLANDS.—This group consists of the four islands, Kalakajóro, Berófia, Nosi Fali, and Nosi Valiha, from 3 to 5 miles within the edge of soundings, and from 6 to 9 miles from the coast in front of the three large bays Rafaralahi, Port Radama, and Raminitok. The islands are mostly clothed with grass or trees, but with very little cultivation, though all are inhabited except Nosi Fali. It will be convenient to describe the islands with their surroundings before proceeding with a description of the bays to which they afford so large an amount of protection.

CAUTION.—As the bottom in the neighbourhood of Radama islands is very irregular, so that similar soundings may be obtained in areas far separated from each other, the banks having been as yet very insufficiently examined; and as, moreover, the islands and mainland are frequently hidden by fog or during squalls, the greatest caution should be used in approaching them, and mariners are recommended to keep in the deep water.

Kalakajóro (*Lat. 13° 57' S., Long. 47° 47' E.*), the northern island of the group, lies S. by W. $\frac{1}{2}$ W. distant $20\frac{1}{2}$ miles from Nosi Iranja; it is about $1\frac{3}{4}$ miles long N.N.E. and S.S.W. by one mile wide, and 538 feet high on its eastern and highest side. Shoal water extends about 8 cables from its western side and $1\frac{1}{2}$ miles from its northern end; rocks, partly above water, also extend about 3 cables from its South extreme, but it is steep-to, and free from danger on the eastern side.

Berófia (Nosi Ovi) is the largest of the four islands, being nearly 7 miles in length N. by W. $\frac{1}{2}$ W. and S. by E. $\frac{1}{2}$ E., by an extreme width of 2 miles; the northern part consists of wooded hills, increasing

General charts 758, 2762, 597, 748a, b.

Chart 705, Pasindava bay to Nosi Shaba. Var. $7^{\circ} 10' W$.

in size towards the southern end, where they are 505 feet high. At this end, a narrow spit of shingle nearly awash at high water extends $1\frac{1}{4}$ miles south-eastward, and is continued by a line of barely submerged rocks about one mile farther, leaving a 20-fathoms channel between it and the reef extending from Berangomaina point on the mainland. The island is safe of approach on the landward side, but the western face is bordered by coral rocks for a distance varying between 3 and 8 cables.

Shelter from the sea breeze may be obtained by anchoring off any part of the eastern side of the island, in from 4 or 5 to 9 fathoms, good holding ground.

Channel.—Between Kalakajóro and Berófia there is a good navigable channel $7\frac{1}{2}$ cables wide, with a central depth of about 16 fathoms. Shoal water extends some distance from the North point of Berófia, therefore it is best to pass nearest to Kalakajóro, taking care to avoid the rocks off its southern end before described.

Nosi Fali (Antani Mora) (*Lat. $14^{\circ} 7' S$, Long. $47^{\circ} 45' E$*) is 472 feet high, and lies 4 miles south-westward from Berófia; it is about $1\frac{1}{2}$ miles long, East and West, and half that width; it is surrounded by reefs, which are most extensive on its northern and eastern sides. The depths between it and Berófia are from 14 to 20 fathoms, deepest near the latter island.

Nosi Valiha.—The north-western point of this island lies S.E. by E. nearly 3 miles from the nearest point of Nosi Fali; it is about 3 miles long N.W. and S.E. by $1\frac{1}{2}$ miles in width. At its north-western point is a hillock 184 feet high, but in the south-eastern part, the hills rise to a height of 564 feet. There is a village on the western side; on which side also, southward of the village, a fringing reef extends in some places fully 5 cables from the shore, as it does also at its north-western end; but there is a clear safe channel, $1\frac{1}{2}$ miles wide, between the reefs of this island and those of Nosi Fali, with depths of from 9 to 14 fathoms.

Nosi Valiha occupies a central position in the entrances to both Raminitok and Kabambi bays, and, in their direction, the water deepens suddenly at one mile or $1\frac{1}{2}$ miles from the island to as much as 42 fathoms before getting amongst the coral reefs of those bays.

Outer shoals.—There are many dangerously shoal patches within the bank of soundings, northward of the Radama islands, as described at pages 373, 374, as well as westward and south-westward of them, which necessitate the greatest attention on the part of the navigator when running down the coast, or when bound to a port within the islands. The outer shoal at present discovered, lies 17 miles W. $\frac{1}{2}$ S. from Nosi Valiha with $3\frac{3}{4}$ fathoms over it; from thence a chain of shoals with

General charts 758, 2762, 597, 748a, b.

Chart 705, Pasindava bay to Nosi Shaba. Var. 7° 10' W.

from 9 to 16 feet water extends northward, passing about 5 miles westward of Berófia and Kalakajóro, and continuing farther northward. Some of these 16-foot patches lie 4 miles W.S.W. from Kalakajóro, and there are less depths between them and Nosi Fali. S.W. by S. distant 4 miles from the peak of Nosi Fali is a coral patch awash at low water, with from 13 to 18 feet around it. In 1881, the *Bisson* reported a level bank about a mile wide, with from 5 to 5½ fathoms, about 6 miles westward of Kalakajóro, but according to the latest charts this is at least one mile outside the bank of soundings.

Over the whole of this outer bank the water is so clear that the bottom can be seen in 16 fathoms, and the outer edge, where the depth increases very rapidly to seaward, is distinctly indicated by the change in the colour of the water.

Vaudreuil bank (*Lat. 1° 57' S., Long. 47° 51' E.*).—This shoal, lying nearly midway between the northern part of Berófia and the mainland, is about 3 miles in length, North and South, and from 4 to 6 cables wide; towards each end, there are rocks almost awash, but the bank is broken in the centre for nearly half a mile by deeper water. From the northern end of the bank the North extreme of Kalakajóro bears W. ½ N., and is distant 3¾ miles. There is a navigable channel 8 cables wide, with from 6 to 9 fathoms water, between the southern end of the Vaudreuil bank and the reefs extending 3½ miles N.W. by W. from Lavalohálíka point, on the mainland.

Directions.—In coming from the westward, a passage through the shoals will be found with at least 3½ fathoms by steering for the southern peak of Kalakajóro bearing E. by S. Approaching from the northward, the eastern extreme of Berófia should be slightly open of the eastern side of Kalakajóro bearing S. by E. ¼ E., as that also leads across the bank in a safe depth.

Caution is, however, necessary in the approach to these islands, as it is not improbable that other dangers exist in addition to those already found. On the other hand, the water at the outer part of the bank is very clear, the bottom, with a favourable light, being generally visible in from 7 to 9 fathoms. Seeing the inner reefs is, however, very uncertain, especially during the rainy season, when the water is discoloured by the discharge from the rivers. *See* also Caution, page 375.

Coast.—At 6 miles southward of Baramahamai creek, is another break in the coastline, where the small River Andranomanilika discharges into the sea over a bed of rocks. From thence southward the coast presents a series of cliffs and small patches of beach as far as Sangajira point, which is the western extreme of a hill sloping gently towards the sea; the coast then trends south-eastward for 8 miles to

Chart 705, Pasindava bay to Nosi Shaba. Var. $7^{\circ} 10' W$.

the mouth of the Bezavona river, thus forming the northern side of Rafaralahi bay.

RAFARALAHY BAY (*Lat. $15^{\circ} 57' S$, Long. $47^{\circ} 55' E$*), the northernmost of the three large bays opposite Radama islands, is $6\frac{1}{2}$ miles wide between Sangajira and Lavalohálíka points, and recedes 6 miles to the eastward; the last-named point has a small hill 180 feet high near its extreme, and another 275 feet high, $1\frac{1}{4}$ miles S.E. by E. $\frac{1}{2}$ E. from it. The outer part of the bay is bounded on each side by reefs extending $1\frac{1}{2}$ miles from the shore on the northern side, and nearly one mile on the southern side, in which are many openings between masses of coral rock. From Lavalohálíka point, the shore reef, which, as before stated, extends N.W. by W. $3\frac{1}{2}$ miles, has a 7-foot boat passage through the middle of it, and dry sandbanks near the outer part. There are also several detached shoals in the bay, which becomes very foul and shallow towards the head; one dangerous patch, drying in parts, has 4 feet at its western edge, which bears S. $\frac{1}{4}$ W., and is distant $3\frac{1}{2}$ miles from the Custom-house flagstaff at Andranto. The general depth is from 9 to 4 fathoms, clay bottom and good holding ground.

The principal rivers which discharge into the head of Rafaralahi bay are the Bezavona or Sahabé and the Beampongi, which appear to be navigable by boats for some distance, the latter being one of the mouths of the Berondra river.

General directions.—On quitting the anchorage at Hellville for Rafaralahi bay, the passage may be made on either side of Ankazoberavina or Passage island and Nosi Kivinji, remembering there is a shoal with 4 $\frac{1}{2}$ fathoms over it lies midway between Ankazoberavina and the mainland; from thence a vessel should pass not farther than one mile from Antangena point, and coast along at from 8 cables to one mile from the coast, in order to avoid the $3\frac{1}{2}$ -fathoms bank extending eastward from the Iranja islands, as well as the shoals, described, which lie from $1\frac{1}{4}$ to 2 miles off-shore north-westward of the entrance to Baramahamai creek. After a run of 3 miles past the creek, keeping clear of the $2\frac{3}{4}$ -fathoms patch eastward of the Vestal reef, and rounding Komameri point, the course should be shaped for a position 2 miles westward of Sangajira point, the northern extreme of Rafaralahi bay, and from thence for the anchorage; for which a good guide is, Fort Sada flagstaff in line with the red-coloured road up the side of the hill bearing N.N.E., and anchoring off Andranto according to draught.

In front of Andranto are two bays in the reef; the eastern one, known as the Haven, affords moderately good protection, and is frequented by a number of coasting vessels; when approaching from the southward, they use the passage between the shore reef off Lavalohá-

General charts 758, 2762, 597, 748a, b.

Chart 705, Pasindava bay to Nosi Shaba. Var. $7^{\circ} 10'$ W.

lika and the Vaudreuil bank by keeping the Two Sisters in line with a hollow in the form of a saddle on the hills in the foreground, but this passage should not be attempted by strangers.

Small vessels of less than 10 feet draught, with thorough local knowledge, may go into the Haven even at low water. Having brought the Custom-house flagstaff to bear N. by E., the practice is to steer about N. by E. $\frac{1}{2}$ E., between the Custom-house flagstaff and that at Fort Sada, keeping a lookout for discoloured water, and so to the anchorage. The position of native boats off Andranto, their masts being seen over the reef, is likely to deceive a stranger.

Anchorage.—The *Flying Fish* anchored off Andranto in 9 fathoms, with Lavalohálika point S. 3° E., and the South extreme of Kalakajóro N. 89° W., apparently very close to the edge of the reef, but found the anchorage good, and that the sea breeze blew home during the hottest hours of the day, rendering the temperature more agreeable than at other places on this coast.

Tides.—It is high water, full and change, at Andranto, at 4h. 30m.; springs rise $14\frac{3}{4}$ feet, neaps $10\frac{1}{4}$ feet. High and low water succeed each other at fairly regular intervals, but the height of consecutive tides varies greatly, as large a difference as 7 feet having been noted.

Landing.—The shores of the bay are so covered by mangrove trees as to render landing impossible, except at two places, viz., at the town and on the southern side of the bay a little within the entrance point. At low water, it is difficult to land abreast of the town in large boats, as they ground a long distance from the shore; it is then best to proceed higher up the bay and enter a channel which leads back to the town. Boats of light draught can effect a landing at all times of tide a short distance westward of the Custom-house.

Andranto or Anorontsanga (Lat. $13^{\circ} 55'$ S., Long. $47^{\circ} 56'$ E.).—The town, and Custom-house marked by a flagstaff, stands near the water, about 2 miles south-eastward of Sangajira point, commanded on the northern side by Fort Sada, constructed on a hill 417 feet high and steep on its northern side; the fort is enclosed by palisades, and at the south-eastern corner stands a building, formerly the residence of the governor of the province under the Hova government. The village of Tanandava extends along the crest of the hill westward of the fort.

Supplies.—Beef is said to be cheap and good, also fowls, ducks, &c., but vegetables are scarce and dear.

PORT RADAMA (Sahamalaza bay) has not been thoroughly examined, and should be approached and entered with great caution, for although there is a large extent

General charts 758, 597, 748a, b.

Chart 705, Pasindava bay to Nosy Shaba. Var. $7^{\circ} 10' W$.

of good anchorage ground, there are in all probability shoals other than those at present known and charted. The port is a deep inlet, 6 miles wide at the entrance between Lavalohálíka and Berangomaina points; the former, with its extensive reefs, has been already described at page 376; the latter, known also as Inverarity point, attains a height just within it of 200 feet, and is surrounded by a fringing reef extending a mile from the shore in all directions, but with two deep indentations. This point is the N.W. extreme of the peninsula, which separates Port Radama and the Manongarivo river from Raminitok bay. The eastern extreme of the peninsula, where that river may be said to commence, is named Ambolibozo bluff, a rocky point with a growth of mangroves rising immediately to a conical hill 236 feet high, and bearing S.E. $\frac{3}{4}$ E. distant 8 miles across the land of the peninsula from Berangomaina point.

Reefs extend from the shores on each side of the port, but leave some clear spaces on the southern side, while from the northern side, at 3 miles within Lavalohálíka, they extend more than halfway across the channel. There are also large shallow reefs in mid-channel at the entrance, and many smaller shoals in all directions.

Depths.—The port takes a south-easterly direction for about 8 miles, and then turns to the southward for another 5 miles, where it receives the waters and takes the name of the River Manongarivo or Manonganio; the depths throughout are very irregular, and can only be understood by carefully studying the chart, when it will be seen that there are many suitable places for a vessel to anchor in from 8 to 12 fathoms.

Verte islet (*Lat. $14^{\circ} 4' S$, Long. $48^{\circ} 0' E$*).—About 4 miles within the northern entrance point is the village of Ankatafa, and southward of it, about 8 cables from the shore, is this small flat islet surrounded by reefs, thickly wooded, and with a remarkable cluster of trees near the centre.

About 7 miles within Lavalohálíka point, and $2\frac{1}{2}$ miles beyond Verte islet, the Berondra river runs into the north-eastern angle of Port Radama, and $2\frac{1}{2}$ miles E.S.E. from the entrance of that river is the summit of Mount Ankarami, 1,335 feet above the sea; S.S.E. $\frac{3}{4}$ E. distant $12\frac{1}{2}$ miles from the same river entrance is Mount Angoroni or Marotaolana, 2,139 feet high. These two mountains are devoid of vegetation; the second, standing entirely isolated, is flattened at the top, and has dark and nearly horizontal stripes. In the interior, successive mountain chains increase in height until they attain an altitude of 6,100 feet; when not covered with mist, they are visible from a very great distance. South-westward of the bay, about 15 miles distant,

General charts 758, 2762, 597, 748a, b.

Chart 705, Pasindava bay to Nosi Shaba. Var. 7° 20' W.

may be seen, on the top of Mount Ampombiabo, 1,217 feet in height, a remarkable clump of trees called La Canine.

Directions.—In steering for Port Radama, when between the Vaudreuil bank and the northern end of Berófia, about 6 cables from the latter, Marotaolana peak will be seen bearing S.E. easterly 25 miles distant, and forming a magnificent landmark as a vessel proceeds up the channel of the port.

To enter the port, having passed eastward of Kalakajóro, keep along within 5 or 6 cables of the Berófia coast until the hill on Berangomaina point bears S.E. by S.; then steer direct for it until Verte islet is on with the southern slope of Mount Ankarami bearing E. by S. $\frac{1}{4}$ S. Follow that line until Berangomaina hill bears South; then steer S.E. by E. up the estuary between the flats extending from the southern shore, and the reefs and mid-channel patches on the northern side, until the conical hill, 236 feet high, on Ambolibozo bluff, bears S.S.W.; then steer S. by E. having as a leading mark ahead a very red patch in line with the left declivity of a table land rising 993 feet above the sea. Follow this line until the summit of the peninsula, 590 feet high, is in line with Ambolibozo point bearing S.W., when steer direct for that point, leaving about 8 or 9 cables distant on the starboard hand a coral flat of considerable extent northward of the point, which, according to the charts, has 3 feet over it, but, according to the French "Instructions," dries 5½ feet.

Anchorage.—Following the directions just given, an inner land-locked anchorage may be obtained in from 8 to 12 fathoms at from 3 to 6 cables, or at any convenient distance from Ambolibozo point, but swinging room round the vessel should be carefully sounded, to guard against the possible existence of unknown coral heads. There is also good anchorage farther out in about 10 fathoms, with Ankarami peak bearing E.N.E., and Ambolibozo hill S. by W.; or, vessels not wishing to run far up the harbour may pick up a good berth on the southern side within the entrance, and 7 cables off-shore, in about 9 fathoms, with Berangomaina hill bearing W. $\frac{1}{2}$ S. about 2 miles distant.

Tides.—It is high water, full and change, at Radama, at 4h. 40m.; springs rise 13 feet. Probably, an inequality of rise somewhat similar to that at Andranto would be found to exist here also.

Local winds.—From June to September the S.E. monsoon is sometimes felt with great force in this vicinity; it generally ceases towards noon, and a fresh S.W. wind springs up about 2 p.m. During the hot season, there are sometimes strong gusts of wind from seaward.

RAMINITOK or Ramanetaka bay (*Lat. 14° 11' S., Long. 47° 53' E.*), which opens out southward of Berangomaina point,

General charts 758, 2762, 597, 748a, b.

Chart 705, Pasindava bay to Nosi Shaba. Var. $7^{\circ} 20'$ W.

and is included between it and Analalava or McCluer point, recedes about 8 miles south-eastward from that line. Though spacious, it is of little value from a nautical point of view, being full of shoals and coral reefs, and the approach from the offing and on either side of Nosi Valiha but partially examined; while, as described at page 376, many outer shoals with from $1\frac{1}{2}$ to 4 fathoms are known to lie scattered about westward and south-westward of the Radama islands. In the southern part of Raminitok bay are the two smaller recesses Ampombiabo and Kabambi bays. The few soundings taken within the bay show a very uneven bottom.

Coast.—On leaving Analalava point, the coast trends south-westward for about 10 miles, and within that space between Andranomena and Antsatsaka points, is a bay $6\frac{1}{2}$ miles wide, but only receding 2 miles, with several villages on its shores, approached through irregular channels in the coral reefs which extend in some places $1\frac{1}{2}$ miles from the shore, and have, in several cases, rocks drying from $1\frac{1}{2}$ to 12 feet near their outer edges. At 2 miles South from Andranomena point is a small hill crowned by a remarkable clump of very tall palm trees. About 2 miles south-westward of Antsatsaka point (*Lat. $14^{\circ} 20'$ S., Long. $47^{\circ} 43'$ E.*), the coastline begins to turn southward for about 15 miles to the entrance of the Antambo river; from thence, again turning south-westward, and with the large peninsula westward of it, forming the deep bay, or, as it would be more properly called, Gulf of Narendri.

Charts 705, 704.

Shoals.—The edge of soundings lies from 10 to 15 miles off this coastline, and has just within it many patches of from $3\frac{3}{4}$ to $4\frac{1}{2}$ fathoms, with very irregular depths of from 6 to 9 and 12 fathoms between them. One 3-fathoms patch is known to exist $9\frac{1}{4}$ miles N.W. $\frac{3}{4}$ W. from the northern extreme of Nosi Lava, and W. by S. $\frac{1}{4}$ S. distant $11\frac{1}{2}$ miles from the highest part of Nosi Shaba.

Nearer the coast, at from $2\frac{1}{2}$ to 5 miles N.N.W., West, and W.S.W. from Andranomena point, are patches with $3\frac{3}{4}$, $3\frac{1}{4}$, and $2\frac{3}{4}$ fathoms, the general depths between them and the shore reef being very irregular, and varying from 9 to 28 fathoms. Northward of Antsatsaka point, about one mile distant, is a coral bank $1\frac{1}{2}$ miles in length, with from $4\frac{1}{4}$ to 7 fathoms over it, 24 fathoms between it and the shore reef, and from 11 to 20 fathoms just outside it; this bank is narrow, and lies parallel with the coast. At 2 miles further north is another bank, with from $2\frac{3}{4}$ to 5 fathoms on it.

Southward of Nosi Shaba, and within 3 miles of the land, there are, as far as known, no dangerously shallow spots until abreast of Nosi Lava.

General charts 758, 2762, 597, 748a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

Nosi Shaba (Saba) is a small island upwards of 3 miles from the coast; it is $1\frac{1}{4}$ miles long East and West, not very high, but has a hillock 98 feet high near its eastern end, and at its western and southern part is another, covered with trees and 140 feet high; the south-western extreme is low and sandy, producing brushwood only. In the northern part are several small springs of fresh water. A reef extends one mile from the northern and western sides.

Lyra bank, lying midway between Nosi Shaba and Nosi Lava, at $4\frac{1}{2}$ miles from the mainland, is composed of coral, and within the 5-fathoms line is more than one mile in extent. Its shoalest part, a small $2\frac{1}{2}$ -fathoms patch, lies S.S.W. $\frac{1}{2}$ W. distant $4\frac{1}{2}$ miles from the south-western extreme of Nosi Shaba.

NOSI LAVA, 8 miles S.S.W. from Nosi Shaba, is $4\frac{1}{2}$ miles in length and $3\frac{1}{4}$ miles wide at its southern end; it consists of numerous hills of moderate height, a small peak 351 feet in height, one of three near the centre, being the highest; close to the south-western extreme is a hill 226 feet in height. The northern point is a steep white cliff, a remarkable object when seen from the westward; the eastern point forms a peak, the north-eastern point is low and rocky, and the southern end is a low sandy point; the whole of the western side presents a series of white cliffs with sandy beach at intervals; these cliffs show very clearly in the afternoon with the sun shining on them. Salara, the principal village, is in a bay in the north-eastern part of the island; about the middle of a hill behind it there is a long white mark, visible 10 miles; on the beach a little northward of Salara is an isolated perpendicular rock, slightly covered with vegetation.

The village of Salara is on a tongue of sand separated from the shore by a mangrove swamp, dry at low water, but forming a lagoon at high water; it is at the foot of a fine valley. At its south-eastern part is the flagstaff of the village chief; there are two other small villages, one at the northern end, the other on the western side of the island. Numerous herds of cattle are to be found on the island, also a calcareous stone capable of making excellent lime.

Nosi Lava is not cultivated, but cocoanut trees and mangoes grow readily; there are four or five good springs.

LIGHT (*Lat. 14° 31' S., Long. 47° 57' E.*).—On the summit of Nosi Lava, from a black and white metal tower, 49 feet high, is exhibited, at an elevation of 394 feet above high water, a group flashing white light, showing a group of two flashes every ten seconds.

Shoals.—S.W. rocks.—A reef extends more than a mile from the south-western end of Nosi Lava; and at 4 cables beyond it, S.W. $\frac{1}{2}$ W. distant $1\frac{9}{10}$ miles from the south-western point, are the two

General charts 758, 2762, 597, 748a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

S.W. rocks which uncover respectively 3 and 5 feet, and have a depth of 6 fathoms between them and the shore reef, and 9 or 10 fathoms close outside. The summit of Nosi Soi in line with Mount Marotaolana S. 49° E. leads about 5 cables south-westward of these rocks.

From the northern end of Nosi Lava, a reef extends about 7 cables, and the whole western side is fringed with reefs, the eastern side being tolerably clear except for a short distance off salient points. At 2 miles East from the S.W. rocks, the small islet Nosi Toloho, consisting of two large black rocks, of which the southernmost, 36 feet high, is clothed by a scanty vegetation, lies at the edge of the shoal extending from the southern shore, there being a depth of 2 or 3 feet only between it and the coast of Nosi Lava.

Shoal water extends S.S.W. a distance of 5 cables from Nosi Toloho.

West Lango bank (*Lat. 14° 34' S., Long. 47° 40' E.*) of sand and coral extends $3\frac{1}{4}$ miles west from Nosi Lango. N.W. Lango bank, which is separated from Nosi Lango reef by a channel $2\frac{1}{2}$ cables wide, is $1\frac{1}{4}$ miles wide and one mile long; it has only 9 feet over it in many places at low water. A coral head, with $4\frac{1}{4}$ fathoms over it, lies 6 cables north-west of N.W. Lango bank, and about 5 cables further north-westward a shoal extends from Nosi Lava, having $2\frac{3}{4}$ fathoms on its outer edge, which is very steep-to and marked by heavy swirls.

Directions.—The bay is easy of access even to vessels of deep draught; those from the southward take the southern passage, clearing the S.W. rocks by the mark already given, bring the north point of Nosi Langor to bear N. 85° E., and steer for it until Nosi Soi bears S. 41° W., when steer with Nosi Soi astern on this bearing until the south-east point of Nosi Lava is rounded, then alter course to the northward, keeping Nosi Soi its breadth open east of the point, which leads midway through Nosi Lava channel between the coral reef with $4\frac{1}{4}$ fathoms over it and the south-east edge of the bank which extends from the east coast of Nosi Lava, Nosi Soi kept open of the point clears this bank; when the north-east point of Nosi Lava bears N. 42° W. steer for it, this leads $1\frac{1}{4}$ cables from the coast bank, when anchor as recommended.

Vessels from the northward, passing outside all the shoals, should not bring the eastern side of Maromoni point southward of S. by E. until the northern end of Nosi Lava bears E. by S. $\frac{1}{2}$ S., when the latter may be approached and rounded at a distance of $1\frac{1}{4}$ or 2 miles, the lighthouse brought to bear S. 38° W., and anchorage steered for as recommended.

Anchorage.—The best anchorage off Salara is with Nosi Lava lighthouse seen just to the right of a corrugated iron house, bearing

General charts 758, 2762, 597, 748a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

S. 38° W., and Ballon Loza peak open twice its breadth of Nosi Lava east point bearing S. 51° E. This anchorage is in the centre of a circle with a radius of about 160 yards, outside the 5-fathoms line, and well sheltered from choppy seas. There is a coral head with only 6 feet over it $2\frac{1}{2}$ cables northward of the anchorage; another, with $4\frac{3}{4}$ fathoms over it, 3 cables north-eastward of Pilier point; and another, with $4\frac{1}{2}$ fathoms over it, half a mile north-eastward of the east point of Nosi Lava.

Tides.—It is high water, full and change, at Nosi Lava, at 4h. 20m.; springs rise $11\frac{3}{4}$ feet, neaps $8\frac{1}{4}$ feet.

Supplies.—Salara village is resorted to by country vessels for cattle, wood, and water; the latter being obtained from wells. Slave dhows were formerly in the habit of calling here to obtain information respecting their trade. Good and cheap beef may be bought at Salara, and at all the villages eggs and fowls may be procured, but water in any large quantity is difficult to obtain.

Nosi Soi (*Lat. $14^{\circ} 37' S.$, Long. $47^{\circ} 36' E.$*) is an inaccessible bluff-sided rock 279 feet high and covered with trees; when bearing S.E., the upper part takes the form of a saddle, of which the pommel is towards the North-east.

Shoals extend 5 cables west and south-west of the island; a rocky head, situated 160 yards west of the island, dries $3\frac{1}{2}$ feet at springs, also some rocks off the south point.

PORT OF ANALALAVA.—**River Antambo** or **Loza** is about 9 miles south-eastward of the anchorage described at Nosi Lava, and at the north-eastern side and entrance of Narendri bay; it discharges its waters through a very narrow and deep channel, the scenery on each side being most picturesque. The banks were formerly covered with villages, now destroyed or abandoned; the country is to all appearance fertile, but, in 1896, was entirely uncultivated. On the southern side of the entrance is the village of Analalava. Mount Antsatramahavelona, 1,089 feet high, a conspicuous summit, lies N.E. by N. a distance of 9 miles from the entrance of the river; Ballon Loza peak, 725 feet high, also very conspicuous, lies E.S.E. a distance of about 4 miles from the entrance; $2\frac{1}{2}$ miles south-westward of Ballon Loza is False Loza peak, 460 feet high, and 7 miles in the same direction is Tombeé de Marotaolana, 850 feet high.

Depths.—There is a depth of 6 fathoms in the Middle pass, $5\frac{1}{2}$ fathoms in the North pass, $3\frac{1}{2}$ fathoms in the South pass, and 14 fathoms at the anchorage. The depths in the river are very great, but irregular.

At night, a least depth of $3\frac{3}{4}$ fathoms will be carried through the Middle pass.

General charts 758, 2762, 597, 178a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

Approach.—Shoals.—Nosi Lango and Nosi Faohina are two densely wooded islets lying about 3 miles off the entrance, they are surrounded by extensive reefs; the summit (tree tops) of Nosi Faohina is 72 feet high, and Nosi Lango 56 feet high. Lango tail, which is a continuation of West Lango bank, described on page 384, has on its extreme a coral head with 3 fathoms over it, it lies in the western entrance to the Middle pass. Channel bank extends nearly half the breadth of the Middle pass, and on its north-western extreme has only $3\frac{3}{4}$ fathoms over it; vessels may pass on either side of this bank. A coral head, with $3\frac{3}{4}$ fathoms over it, lies N.N.E. a distance of $1\frac{1}{4}$ miles from Nosi Lango; East Lango bank extends about one mile eastward of the reef southward of Nosi Lango; there is a detached bank, with $1\frac{3}{4}$ fathoms over it, about half a mile southward of Nosi Faohina, and Table bank extends about $1\frac{1}{2}$ miles northward of Antsamanara point.

The *green* sector of Analalava light shows over the southern end of Nosi Lango reef and shoals, and the *red* sector over Lango tail and the northern end of Nosi Faohina reef and shoals.

LIGHTS (*Lat. 14° 38' S., Long. 47° 46' E.*).—On a hill about half a mile southward of Analalava village is exhibited, at an elevation of 203 feet above high water, a *fixed* light, with *white*, *red*, and *green* sectors. The *white* and *red* lights are visible from a distance of 9 miles, and the *green* 7 miles. For sectors, *see* Light list and chart.

On a hillock, distant $8\frac{1}{4}$ cables N. 2° E. from Analalava lighthouse, is exhibited, from a column 23 feet high, at an elevation of 62 feet above high water, a *fixed* light, with a *red* and a *white* sector. The light is visible from a distance of 2 miles, and is known as Ampasikeli light. For sectors, *see* Light list.

Beacons.—A black beacon, surmounted by a black ball, marks the southern extremity of Nosi Lango reef, and a similar one the northern extremity of Faohina reef.

There are two sets of leading beacons; the set on the northern side of the entrance to the river has the front beacon on the coast a short distance southward of the village of Andronjana South, and the rear beacon on the crest of the hill, 360 feet high, behind the front beacon; the set on the southern side of the river entrance has the front beacon on a small detached plateau, 160 feet high, near the coast, about midway between Analalava and Antsamanara point, and the rear beacon about 5 miles S.E. $\frac{1}{2}$ E. from the front beacon on a tree in a little wood below the crest of the hills which bound the horizon in that direction.

Channels.—Directions.—**Middle pass**, which is the principal channel of approach to Analalava, is about half a mile wide between the 5-fathoms lines; it is obstructed on the west side by Lango tail and on the east side by Channel bank, but by means of the leading beacons by day a depth of not less than 6 fathoms may be carried

General charts 758, 2762, 597, 748a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

through the channel, and by means of the light a depth of not less than $3\frac{1}{4}$ fathoms may be carried through at night.

Nosi Soi may be passed on either side. If on the southern side keep Ballon Loza peak in line with the highest trees on Nosi Faohina bearing S. 80° E. until Mount Antsatramahavelona is open to the right of Nosi Lango, when the leading beacons on the northern side of the entrance to the river should be in line N. 76° E.; the front beacon is not very clear in the morning, but a conspicuous trapeze summit behind the rear beacon will lead equally well through the first part of the channel; later on it disappears behind the rear beacon, but before then the front beacon will have been recognised. If passing northward of Channel bank alter course when the lighthouse is in line with Ballon Loza peak, which leads to the anchorage; if passing southward of Channel bank alter course when the beacons on the southern side of the river entrance are in line, S. 52° E., and keep them in line until the Doctor's house at Analalava, a white house with a red roof and surrounded by a verandah, bears S. 89° E., when Channel bank will be cleared and course may be altered for the anchorage. If passing Nosi Soi on the northern side, Analalava lighthouse open northward of Ballon Loza peak, and bearing S. 78° E., will lead through the channel as far as Channel bank.

At night, keep in the *white* sector of Analalava light, this will lead through the channel, but over the $3\frac{1}{4}$ fathoms on Channel bank.

North pass (*Lat. 14° 33' S., Long. 47° 43' E.*) may be used by vessels coming from the northward, and a least depth of $5\frac{1}{2}$ fathoms will be found by following these directions: After passing Nosi Shaba keep the S.W. summit (138 feet) to bear astern N. 7° W. until Nosi Faohina is open eastward of Nosi Lango, S. 15° W., when steer on this mark, which will lead between a 4-fathoms and $4\frac{1}{2}$ -fathoms patch of coral; when the south point of Nosi Lava bears S. 87° W. alter course to the eastward, and bring the front beacon southward of the river entrance to bear S. 17° E., and keep it on this bearing until the lighthouse is in line with Ballon Loza peak, which will lead to the anchorage.

South pass is about half a mile wide, and has only $3\frac{1}{2}$ fathoms in it at low water, but it is very useful for vessels of light draught, as the tidal streams in it are not nearly as strong as those in the Middle pass. Keep Analalava lighthouse bearing N. 78° E. until Nosi Lango is open eastward of Nosi Faohina, when steer for the rear beacon (360 feet) northward of the river entrance, and keep it bearing N. 56° E. until on the leading line to the anchorage.

Anchorage.—There is convenient anchorage with the lighthouse in line with Ballon Loza peak and Filao's point (south of the anchorage) in line with a small remarkable summit (456 feet) bearing S. 32° W.; there is here 14 fathoms, sand and mud, and a vessel is $1\frac{1}{2}$ cables from shoal water, and out of the strength of the tidal streams.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

Tides.—See Tides at Nosi Lava, page 385.

Analalava (Lat. $14^{\circ} 38' S.$, Long. $47^{\circ} 46' E.$) is the chief place of the province of that name, which province, in 1906, had a population of 70,281, of whom 115 were Europeans and 184 Asiatics or Africans; it was only a small place when Madagascar was taken over by the French, but since then has developed considerably. It has a considerable trade in the export of rafia and cattle to Africa. In 1910, the total value of imports was £16,107, and exports £29,754; 2,675 vessels entered the port, of a total tonnage of 60,091 tons. The temperature during the dry season ranges from $80^{\circ} F.$ to $87^{\circ} F.$, the maximum being reached about 3 o'clock in the afternoon; it is always 2° cooler at night than in the daytime. The rains commence towards the end of November, and the maximum downfall occurs in January. During the rainy season the winds are variable, but generally from N.W. and S.W., the thermometer ranges from $85^{\circ} F.$ to $88^{\circ} F.$, but the heat is bearable; this is the unhealthy season.

Landing is difficult at low water, as it has to take place about 300 yards from the coast.

Communication. — The branch steamer of the Messageries Maritimes between Diego Suarez and Zanzibar calls here on the 16th or 17th of each month, outward bound, and on the 2nd or 3rd, returning, and a small Government launch plies between this and other coast stations. There is telegraphic communication with Antananarivo by Mandritsara, and with Diego Suarez by Antsohihi.

Hospital.—A hospital is situated on the slope of the plateau at the east end of the town; there are three large huts, two of which are intended for natives.

Supplies.—Cattle are easily procurable, also poultry, preserves, and vegetables. Water is abundant in the Analalava river and most of the valleys, but it would have to be embarked in casks.

NARENDRI BAY.—On approaching this bay from the westward, the most remarkable objects are the white cliffs 7 miles south-westward of Maromoni point, where the undulating hills behind are 200 or 300 feet high; and also the sandy beach which lines the coast for 8 miles from the point. Maromoni point is of moderate height, with trees near the extreme, until it terminates in the sandy beach above mentioned; a few huts stand on its northern front, and, facing the bay, the point terminates in red cliffs about 25 feet high. On a nearer approach, Nosi Soi, with its perpendicular sides, will be distinguished. Within Maromoni point, and $3\frac{1}{2}$ miles S.S.E. $\frac{1}{2}$ E. from it, is Komatsana point, with white cliffs at its extreme. Between this point and Vatanombi, $6\frac{1}{2}$ miles to the southward, is a wooded country with a very foul approach to the shore; also a wide but shallow river mouth bordered by mangroves, and about midway between the points,

General charts 758, 2762, 597, 748a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

some canoes or boats almost always to be seen on the beach, mark the position of the village of Ankalafa, hidden behind the trees.

Tombeé de Marotaolana is very remarkable, about $2\frac{1}{2}$ miles inland on the eastern side of the bay; it is the northern extreme of a wooded chain of mountains. In line with the northern side of Nosi Soi, bearing S. 48° E., it forms an excellent mark for clearing the outer shoals.

Shoals.—A bank with $4\frac{3}{4}$ fathoms lies nearly 9 miles N.W. $\frac{1}{2}$ W. from Maromoni point, and another similar bank lies farther north-eastward about $5\frac{1}{2}$ miles from the former. These banks are of coral and near the edge of soundings.

Diamond bank (*Lat. $14^{\circ} 41'$ S., Long. $47^{\circ} 21'$ E.*) is also on the south-western side of the entrance to Narendri bay, about $7\frac{1}{4}$ miles West from Maromoni point, and 4 miles from the coast. There are many heads on this bank, the shoalest being situated exactly on the position of the sounding of $3\frac{3}{4}$ fathoms shown on the chart, it has only 15 feet of water over it, the bank deepens gradually N.N.E. of it, but towards the South it is very steep-to, and a narrow deep channel separates it from another bank on which there is 16 feet water. From the shoalest spot, Maromoni point and Loza peak are nearly in line; the peak kept open northward of the point leads northward of the bank.

The principal entrance to Narendri bay is between Nosi Lava and Maromoni point, where the clear space between the reefs is about 6 miles; after the first 6 or 8 miles towards the South-east, the bay runs about S.W. by S. 24 miles, maintaining a width of 6 miles throughout the greater part.

The depth at the entrance is from 10 to 50 fathoms, and 10 to 20 fathoms are found along the western side until near the head of the bay; close to the extensive bank along the whole of the eastern side there are from 4 to 6 fathoms; in the last 4 miles at the head of the bay the water is very shallow, shoaling gradually from 3 fathoms to the beach.

Narendri village is on the eastern side and 2 miles up Atsinjo river and creek, at the south-eastern part, and about 10 miles from the head of the bay; the village of Ampasindava is on the same side near the entrance. Narendri is of considerable size, and was formerly the residence of the native governor. The vicinity is said to abound in sandal wood. The small rivulet Tsifolahina flows into the bay on the western side; there are several other unimportant streams and many considerable villages on the eastern side.

Anchorage.—The entrance to Atsinjo creek cannot be approached by a vessel nearer than 3 or 4 miles on account of the extensive shoal off it; the best anchorage is in from 6 to 4 fathoms, with the southern point of the creek bearing between East and E. by S.

Tides.—It is high water, full and change, in Narendri bay at 4h. 30m.; springs rise about 14 feet.

General charts 2762, 597, 748a, b.

Chart 704, Nosi Shaba to Moramba bay. Var. 7° 30' W.

Coast.—From Maromoni point, the coast, slightly convex towards the sea, trends S.W. $\frac{1}{2}$ W. a distance of 16 miles to Marolahi point, at the entrance of Moramba bay; this point is 207 feet in height, and slopes down to a red cliff, it should be given a wide berth, on account of a reef extending 6 or 8 cables off it, some of the outer heads of which uncover. Nearly 2 miles north-eastward of Marolahi point is a remarkable umbrella tree on the summit of a rounded plateau 236 feet above the sea level. In coasting from Maromoni point south-westward, a distance of about 2 miles from the shore should be preserved until assured of being southward of the Diamond bank, when that distance should be increased to 3 miles, to avoid a $4\frac{1}{2}$ -fathoms patch about 5 miles N.N.E. from Marolahi point.

Chart 377, Moramba bay to Maromanjo point.

Moramba bay (Lat. $14^{\circ} 54' S.$, Long. $47^{\circ} 18' E.$) is 18 miles south-westward of Maromoni point. It affords good shelter to small vessels, but is closed to others by a bank with a less depth than 15 feet, which bars the entrance from shore to shore. The proper entrance to the bay, where the bar crosses, is about $1\frac{1}{2}$ miles southward of Marolahi point; here it is about 2 miles wide, the bay receding 5 miles to the eastward and opening out into a large shallow basin nearly 4 miles in extent, North and South; it has high wooded rocky shores in its N.W. and North parts, and muddy rivers and mangrove swamps, with several islands, in its eastern and southern sides, and the Île du Goulet in the narrowest part of the entrance.

The inner part of this bay affords perfect shelter, but is only fit for small craft; vessels drawing 15 feet may enter at or near high water, and anchor about 2 cables south-eastward of the Île du Goulet in about 5 fathoms, but they should not attempt it without previously examining the passage. The best depth will be maintained by steering for the South side of Île du Goulet, bearing E. by N.

Tides.—At Moramba bay it is high water, full and change, at 3h. 53m.; springs rise $11\frac{3}{4}$ feet, neaps $8\frac{1}{4}$.

General anchorage.—Off any part of the coast from Narendri bay to Cape St. Andrew, there is good anchorage generally, between the outer reefs and the shore, the bottom being soft adhesive mud and the depths tolerably regular and not too great; off Makambi island only is the bottom reported to be hard sand.

OUTER REEFS.—From abreast of Narendri bay, the Outer reef, which is of the nature of a submerged barrier reef, and is a continuation of that which commences near Nosi Kivinji off the north-western side of the Ambavatobi peninsula, continues south-westward at from 10 to 15 miles from the shore as far as abreast of Bali bay, a distance of 156 miles, or, including the portion northward of Narendri, about 230 miles.

General charts 2762, 758, 597, 748a, b.

Chart 377, Moramba bay to Maromanjo point. Var. 7° 50' W.

As soundings on this Outer reef have been chiefly taken not with the object of finding the shallowest spots on it, but to discover the best passages through, it is not improbable that shallower depths than any as yet charted may hereafter be found in many places; consequently, whatever a vessel's draught may be, it is always best to cross the Outer reef by one of the passages indicated, as they at least have been examined with some exactitude.

From Mahajamba bay westward, the principal known shoals on this outer reef, as well as the passes, are all named. The least known depth is 2 fathoms, but there are very numerous patches with between 3 and $4\frac{1}{2}$ fathoms. On one bank only, the Thetis bank, off Tanjona, the coral appears to be still living, and the bottom very irregular; elsewhere the bottom is regular, the coral being dead and almost always covered with sand or seaweed.

Current.—A constant south-westerly current runs along the outside of the Outer reef at from one to $1\frac{1}{2}$ knots. A similar current is experienced between the Outer reef and the coast, though, at the same time, the ebb and flood streams may be felt strongly within the bays.

Shoal.—About 6 miles south-westward of Moramba entrance, and 4 or 5 cables off-shore, near a headland, are patches of rock with from 4 to 6 feet over them and 3 fathoms around. These rocks were discovered by the *Tirailleuse*, and their exact position is unknown, though there is no doubt of their existence. They are, however, so close inshore as scarcely to constitute a danger.

Chart 377 and plan 702.

MAHAJAMBA BAY (Mazambo) (*Lat. 15° 12' S., Long. 47° 0' E.*).—The bay is approached from seaward by two passes through the Outer reef, viz., the North pass and the Grand pass; the latter is by far the widest and best. Approaching by it, Masiaposa or Table hill, 705 feet high, is the first seen and best-defined object on the eastern side of the entrance, and appears as a wooded plateau; next will be made out False Table hill, E. by N. $\frac{3}{4}$ N. distant 8 miles from the first, and very similar in height and appearance. To the westward and on the western side of the entrance, the plateau of Ambararata will be recognised, and if the sun is shining on them, two rows of red cliffs near it. In the rainy season a large waterfall may be seen in the western row of cliffs, and it offers a good mark for entering the Grand pass. There is at these cliffs a remarkable detached sugar-loaf hill, 374 feet high, and crowned with trees.

Ambohitsambo and Antranonaomoi hills, the former 607 feet high, and both 7 or 8 miles inland on the western side of the bay, are distinguished by their rugged outline.

General charts 758, 597, 748a, b.

Chart 377 and plan 702. Var. 8° W.

Ambatomifoko point, nearly 6 miles north-eastward of the entrance to Mahajamba bay, is rocky, and shoals extend a mile off it. At 5 miles northward of the point is a sandbank, about $1\frac{1}{2}$ miles in extent, and having a least depth of $4\frac{1}{2}$ fathoms over it, and westward from the point shoals extend for about $4\frac{1}{2}$ miles, the least depth, near the outer edge, being $3\frac{3}{4}$ fathoms; this point, therefore, should be given a good berth.

Plan 702, Mahajamba bay.

Manakara, the eastern entrance point to the bay, is remarkable from a white patch just southward of it, which shows up well in the afternoon sun and is useful in navigating the West channel.

Ambararata point (*Lat. 15° 12' S., Long. 46° 58' E.*), the western entrance point to Mahajamba bay, bears West, and is distant 5 miles from Manakara point; it is high and presents the remarkable appearance just now described. The entrance contracts gradually from 5 to 2 miles when 10 miles up the bay, where it turns southward and opens out into a vast basin of shallow water.

Shoals.—With the exception of the banks described off Ambatomifoko point, the only shoals incommoding the entrance are on the western side, viz., the Lyra, the Intermédière, and the Thetis banks. The last-named extends about one mile N.N.E. from Ambararata point to the 5-fathoms line, with only 7 feet over it half-way out, at low water. This bank on its eastern and western sides is steep-to.

Intermédière bank, of sand and coral, about 3 miles long N.W. and S.E., with a least depth of $2\frac{1}{2}$ to $2\frac{3}{4}$ fathoms near its south-eastern end, bearing about N. by W. distant $1\frac{1}{4}$ miles from Ambararata point, lies outside the Thetis bank, between which and it is the West channel, with general depths of from $5\frac{1}{2}$ to 10 fathoms, and a least width of 5 cables between the shoals.

Lyra bank is a large coral plateau $2\frac{1}{2}$ miles long N.N.E. and S.S.W. by 8 cables wide, with a least depth of $3\frac{1}{4}$ fathoms, and is surrounded by depths of from 7 to 9 fathoms. Its south-eastern end, in 5 fathoms, bears N. by W., and is distant 3 miles from Ambararata point.

Depths.—In the outer bay, *i.e.*, for the first 10 miles from the entrance to the narrows, the soundings are irregular, varying from 9 or 12 to 50 fathoms, but with a general depth of from 12 to 20 fathoms. Near and beyond the narrows, they vary from 40 to 64 fathoms, and in many places no bottom was obtained with 55 fathoms of line, but it then shoals so suddenly that the greater part of the space within is too shallow to be of any use for shipping. Nevertheless, there is a

General charts 758, 597, 748a, b.

Plan 702, Mahajamba bay. Var. 8° W.

considerable area with good anchorage in from 6 to 8 fathoms; but caution is necessary, for, in 1897, it was reported that in this inner basin the depths are frequently from $1\frac{1}{2}$ to 2 fathoms less than those given on the chart.

Nosi Longani or **Manja islet** (*Lat. 15° 18' S., Long. 47° 5' E.*), off the eastern point of entrance to the inner basin, is 415 yards long by 220 yards wide, excluding a small peninsula projecting westward from it. The islet stands on the edge of a shoal extending more than a mile to the northward. Vessels should not go inside a line drawn from Longani point to the western end of the island. On this islet are ruins, in fair preservation, of an Arab establishment supposed to be at least two centuries old.

Rivers.—Many rivers flow into the head of Mahajamba bay, mostly through mangrove jungles and swamps with broad shallows of sand and mud fronting them, and Captain Bezançon of the French Navy reports that these mangrove jungles have encroached at least one mile on the head of the bay since Owen's survey in 1824. In the south-eastern part are the Rivers Sofia and Ambondo; farther westward is the Mahajamba; and in the south-western angle the Befanjava or Sambilahi enters the bay, flowing over a flat many miles in extent and scarcely covered.

Tides.—It is high water, full and change, at Ambararata point, Mahajamba bay, at 4h. 30m.; springs rise $14\frac{1}{2}$ feet, neaps 11 feet, above the level of soundings, which level is 3 feet below ordinary springs; springs range $11\frac{1}{2}$ feet, neaps 5 feet. At Nosi Longani, the rise is about $1\frac{1}{2}$ feet higher than at the entrance.

Chart 377 and plan 702.

Directions.—Approaching from the northward, the North and Grand passes might be considered as one pass through the Outer reef, 15 miles wide, but for the interposition of one small $4\frac{1}{2}$ -fathoms patch, about $5\frac{1}{2}$ miles from the eastern limit of 5 fathoms of the North pass. Elsewhere, the depths, varying from 6 to 30 fathoms and upwards, are sufficient for all classes of vessels. Steer through this pass by a bearing of Mount Masiaposa, and then as requisite for the entrance of the bay. Entering from the westward, the passage between the Lyra and Intermédière banks has no good leading marks, and there is a 4-fathoms bank in mid-channel, therefore it is best to take the West channel between the Intermédière and Thetis banks. For this purpose, run in with Masiaposa in line with Manakara white patch bearing S 75° E. until Ambararata Sugar-loaf bears S. 57° W., when keep it on that bearing, steering N.E. by E. $\frac{1}{4}$ E. until Ampasilava point

General charts 758, 597, 748a, b.

Plan 702, Mahajamba bay. Var. 8° W.

open of Ambararata point bears S. by W., when a course may be steered into the bay.

Anchorage.—The soundings in all parts of the bay being irregular, and the inner bay but imperfectly known, great care is required in navigating its waters; there are, however, many good anchorages. There is excellent anchorage well protected from south-easterly winds in the West channel itself in 7 fathoms, mud, at 3 cables from the shore and about one mile westward of Thetis bank. Or, in the same depth, sheltered from N.W. winds, about 4 cables off-shore on the eastern side of Ambararata point, and here if necessary water can be obtained. *See Supplies, &c.*

The anchorage off the Ambenja river (*Lat. 15° 17' S., Long. 46° 58' E.*), 4 miles up the western side of the bay in 7 fathoms, mud, and 3½ cables from the shore, with Ampasilava point bearing N. ¾ W., and the sandhill near the estuary of the Ambenja W. by S. ¾ S., affords perfect protection from north-westerly winds. It must, however, be approached with caution by vessels of more than 17 feet draught, on account of the shoal flat extending upwards of 2 miles from the shore just beyond this anchorage, and from thence south-eastward the whole distance to the narrows, but gradually narrowing to one mile at 2 miles northward of Tsinjomantsi point. On this flat, the depths are generally less than 4 fathoms, and in one place, for upwards of a mile, only 2¼ fathoms.

There is excellent anchorage on the eastern side, in 5 fathoms, mud, and 7 cables from the shore, off Mangoaka, with the outer islet off Ambolobizo point, in line with Amboaniho, the next point, one mile southward of the other, and Mount Masiaposa bearing E. by N. ½ N. In the inner bay there is a considerable space where good anchorage can be found in 6 or 7 fathoms, but as regards this large area, *see* previous remarks as to depths.

Supplies, &c.—The principal village is Ambenja, on the western side, where poultry can be obtained, as also at Andranomena village, outside the bay to the north-eastward near Ambatomifoko point. At Mangoaka and the village south-eastward of it, cattle may be purchased at a cheap rate. As before stated, water may be obtained without much difficulty from a natural reservoir separated from the sea by a sandbank, about 30 yards wide, at the mouth of a rivulet just inside Ambararata point.

Chart 377, Moramba bay to Maromanjo point.

OUTER SHOALS and PASSES.—Before proceeding with the description of the coast and ports lying westward of Mahajamba bay, it will be convenient to designate the shoals on the Outer reef

General charts 758, 597, 748a, b.

Chart 377, Moramba bay to Maromanjo point. Var. 8° W.

and the Passes through it, westward of the Grand pass, by which that long coastline may be approached.

Boursaint bank.—This shoal, the first south-westward from the Grand pass, has generally from 4 to $4\frac{1}{2}$ fathoms over it, for an extent of 5 miles in a N.N.E. and S.S.W. direction, and is from 11 to 14 miles from the nearest land; it has one shoal spot of 3 fathoms at its southern end. From this spot, Ambararata point bears E.S.E., and is distant $15\frac{3}{4}$ miles.

Vigilant bank, discovered in 1886, has a least depth of 3 fathoms and is a small coral reef lying W. $\frac{1}{2}$ N. northerly, $19\frac{1}{2}$ miles from Ambararata point.

Namakia pass, between the Boursaint and Vigilant banks, is at least 5 miles wide between the 5-fathoms lines, with very varying depths of 10 to 30 fathoms. The pass may be safely navigated by bearings of the land, and keeping a good lookout from aloft.

Romanche bank (*Lat. $15^{\circ} 15' S.$, Long. $46^{\circ} 34' E.$*).—The least water found on this bank is 2 fathoms, but, as the depths vary greatly, less water may exist; the bank lies about 11 miles from the coast and 3 miles westward of the Vigilant bank. Within the 5-fathoms line it is $2\frac{1}{2}$ miles in width East and West, but a long narrow ridge of $4\frac{1}{2}$ fathoms runs up north-eastward close to the edge of soundings, making it 4 miles in extent in that direction; it rises in ridges towards its central southern part from a depth of 16 fathoms. It is composed of gravel, white pebbles, broken red coral, and occasional patches of rock covered with seaweed. In fine weather, its presence is indicated by a bright green tint on the water, visible at some distance from the masthead.

Vaudreuil and Forfait banks.—These banks occupy positions respectively on the north-eastern and south-western ends of a large coral plateau $7\frac{1}{2}$ miles in extent E.N.E. and W.S.W., by 2 or $2\frac{1}{2}$ miles wide, its outer edge being close to the edge of soundings. The least depth on the Vaudreuil bank is $3\frac{3}{4}$ fathoms, and on the Forfait $3\frac{1}{2}$ fathoms. Between the two banks, and on the remainder of the plateau, the depths vary between $5\frac{1}{2}$ and 6 or 7 fathoms. The nearest part of these banks is about $8\frac{1}{2}$ miles from the coast.

Tsimanenoakoho pass.—This pass lies between the Romanche and Vaudreuil banks, and is rather more than $1\frac{1}{2}$ miles wide between the 10-fathoms line on either side. Its position can be recognised from seaward by its being nearly opposite the first and a very marked dip in the hills bordering the coast south-westward of Mahajamba, and about 20 miles from Ambararata point; also by the red cliffs of

General charts 758, 597, 748a, b.

Chart 377, Moramba bay to Maromanjo point. Var. 8° W.

Komani, which bear from the pass about S. $\frac{1}{2}$ W. and appear as a broad red horizontal patch, striped with black vertical lines. Sarodrano hill, a yellowish plateau 417 feet high and crowned with a rather remarkable clump of trees, bearing S. by E. $\frac{1}{4}$ E., leads through this pass.

Chart 378, Maromanjo point to Makambytra bay.

Mariner bank, next westward from the Forfait, and divided from it by the Andranolava pass, is 4 miles long East and West, and $1\frac{1}{2}$ miles wide; it has two shoal patches, one of $3\frac{1}{4}$ fathoms near its western end, the other with 4 fathoms near the eastern end.

Andranolava pass is about $2\frac{1}{2}$ miles wide; it should be entered in the afternoon when the cliffs of Komani and Ampajoni are visible, as a bearing of one or the other is necessary as a leading line through.

Euryalus bank (Lat. $15^{\circ} 24' S.$, Long. $46^{\circ} 10' E.$) is a coral and gravel plateau 4 miles in extent, N.N.W. and E.S.E., by $1\frac{1}{2}$ miles in width, within the 10-fathoms line; it has two shoal heads of $4\frac{3}{4}$ and 5 fathoms respectively, and from 6 to 8 fathoms over the remainder; its shoalest head is at the northern extreme, and is nearly 9 miles distant from the nearest shoal head of the Mariner bank.

Three other banks lie in this vicinity—one nearly midway between the Euryalus and Mariner banks, nearly 2 miles in extent, with generally from 7 to 9 fathoms and a least known depth of $5\frac{1}{2}$ fathoms near its centre; the other two, from 5 to $8\frac{1}{2}$ miles W. by S. from the shoalest part of the Euryalus bank; the least known depth on either of these patches is $5\frac{1}{2}$ fathoms.

Ampajoni pass is the wide channel between the Mariner and Euryalus banks; in its centre is the $5\frac{1}{2}$ -fathoms patch just described, which should be avoided, as there may be less water. The only points visible from outside the pass are the bluffs of Ampajoni and Katsépé, which, at this distance, appear like two islands separated by a wide opening; they may be known by their red cliffs, the former being especially easy of recognition. Vessels should navigate the pass by a bearing of one of these marks.

An attempt was made to buoy this pass in 1895, but the buoys broke adrift or were removed, and there appears to be no intention to replace them.

Katsépé pass, between the Euryalus bank and the Turquoise bank, next westward, cannot be recommended, as, in it, lie the two banks just described; and, as before remarked, although the least known depth on them is $5\frac{1}{2}$ fathoms, coral heads with very little water

General charts 758, 759a, 597, 748a, b.

Chart 378, Maromanjo point to Makambytra bay. Var. 8° 20' W.

over them are often discovered where coral reefs exist, years after a locality has been thought to be well known.

Turquoise bank.—This bank in its shoaler parts is from 3 to 5 miles south-westward of the nearest of the above-mentioned shoals, it is a large coral plateau $6\frac{1}{2}$ miles long N.E. by N. and S.W. by S. by 3 miles in width within the 10-fathoms line, and has on it two known heads of $4\frac{3}{4}$ fathoms, and one of 5 fathoms; it is steep-to on all but its southern side.

Makambi pass.—This pass lies between the Turquoise bank and a long coral bank, with general depths of 6 or 8 fathoms, but with many patches of 5, $4\frac{3}{4}$ and 4 fathoms on it, stretching away 12 miles in a W.S.W. direction. The safe passage is only $1\frac{1}{2}$ miles wide, but Makambi island, 16 miles distant when outside the pass, kept bearing S.S.W., leads through in not less than 11 fathoms.

Tanjona pass, 14 miles westward of the Makambi pass, is the passage between the western end of the long coral bank, just described, and the Thetis bank; it carries very deep water, is nearly 3 miles wide, and is one of the best and easiest of the passes. The extreme of Cape Tanjona, bearing S.S.W. $\frac{3}{4}$ W., leads through in mid-channel.

Thetis bank (*Lat. 15° 37' S., Long. 45° 42' E.*), on which H.M.S. *Thetis* touched in July, 1874, is a bank about 2 miles in extent, with from $3\frac{1}{4}$ to $4\frac{3}{4}$ fathoms, but with one shoal head of $2\frac{3}{4}$ fathoms, from which Cape Tanjona bears S. by W. $\frac{3}{4}$ W., and is distant $9\frac{3}{4}$ miles.

From Thetis bank, a long narrow bank borders the edge of soundings for 15 miles westward to Barker bank; this ridge has general depths, so far as known, of from $5\frac{1}{4}$ to 8 or 10 fathoms. For the reasons already given, however, vessels should avoid passing over it and avail themselves of the better known passes.

Barker bank, directly off Maroambitsi bay, and its shoalest part bearing W.N.W., distant $13\frac{1}{2}$ miles from Cape Tanjona, is 2 miles in diameter within the 5-fathoms line, and almost circular; its least known depth is $3\frac{1}{2}$ fathoms, but very probably there may be less; it is visible from some distance by day in consequence of the change in colour of the water, which assumes a bright green, with large yellow patches, especially marked at or near mid-day.

About 3 miles northward of Barker bank, and consequently at least 2 miles outside the bank of soundings, a depth of 6 fathoms was reported many years ago; its existence is doubtful, but it is still retained on the chart. A good lookout should be kept by any passing vessel in this vicinity.

General charts 758, 759a, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay.

Westward of Barker bank, there is a pass, not named, about 2 miles wide, with from 10 to 18 fathoms, from whence the Outer reef again commences and continues, with depths of $5\frac{1}{2}$ to 9 fathoms, for a distance of 31 miles; the $5\frac{1}{2}$ fathoms, named Emile bank, lies N. by W. a distance of 13 miles from Cape Amparafaka. From the western end of this long bank to the Grenouille bank, a distance of nearly 34 miles, there are several shoal heads, with deep water between them; the least water found was $6\frac{1}{2}$ fathoms, but less water than that shown on the chart may be found, as the survey is incomplete. The northern side of the Outer reef is at the edge of deep water, but the inner side becomes merged in the ordinary bank of soundings extending in this part about 30 miles from the coast.

Charts 377, 378.

COAST.—From Mahajamba bay, the coast trends S.W. by W. $\frac{1}{2}$ W. nearly 50 miles to the entrance of Bombetoke bay, and for the whole distance it may be safely coasted at about $2\frac{1}{2}$ miles from the shore, though at several places shallows extend outwards about half that distance. Nearly midway and at a short distance inland, is a series of vertical marks on a red ground, which, when seen from the sea, resemble fortifications, and make a good landmark. At 23 miles from Ambararata point is the entrance to the Tsimanenoakoho river (*Lat. $15^{\circ} 25' S.$, Long. $45^{\circ} 37' E.$*), which has 7 or 8 feet on the bar at the lowest tides, and a good channel of from $2\frac{1}{2}$ to 5 fathoms within; it is frequented by small craft with parties of wood cutters from Majunga during the fine season, but the entrance is indirect and very difficult for want of any leading mark; the sandbanks and shoals also extend upwards of $1\frac{1}{2}$ miles off-shore at this part. At 8 miles farther westward is the River Andranolava, off which the banks extend 2 miles from the coast; this river is a very considerable water-course, but is so shallow as to be scarcely practicable for a boat; its western entrance point is Maromanjo.

Though there are many marks available for vessels in the offing, as already described, in connection with the various passes through the Outer reef, there is great uniformity in the appearance of the land when coasting. Small cliffs covered with trees border a sandy beach with occasional patches of red where the earth can be seen. At 6 or 7 miles northward of Bombetoke, the red cliffs on the sides of the Ampajoni hills are 240 feet high, their characteristics being the abrupt termination of the southern end.

Tides.—The spring rise along this coast is said to be about 12 feet, and neaps range 5 feet. The time of high water, full and change, 4h. 30m.

General charts 758, 759a, 597, 748a, b.

Charts 377, 378. Var. 8° 20' W.

Supplies.—Beef and fowls can be obtained at Marosakoa village, at the entrance of the Tsimanenoakoho river; also a few fowls at a small village at the entrance of the little River Morira. At Komani point, water can be obtained from a natural reservoir, only separated from the sea by a sandbank 40 or 50 yards wide.

Plan 701, Bombetoke bay.

BOMBETOKE BAY (*Lat. 15° 39' S., Long. 46° 18' E.*).—This important bay, immediately within which on the eastern side is the rising port of Majunga, opens between Points Anorombato on the East and Ampangataha on the West, where it is $3\frac{1}{2}$ miles wide; from thence the bay opens out to a width of 6 miles, and at that distance from the entrance points again contracts to only 3 miles in width, and then again opens out, thus forming an outer and inner bay. The navigable water, varying much in width, extends from the entrance 11 miles to the southward, i.e., well into the inner bay, which then, widening and shoaling, becomes the broad delta of the River Betsiboka, which flows into the bay from the south-eastward through numerous narrow channels, the estuary being 11 miles wide. The greater part of this area is occupied by shallows, sandbanks, and islands covered with mangroves.

Approach. — Landmarks, &c.—Approaching from the northward, Massif Katsépé, 374 feet high, on the western side of the entrance, is the highest point of land in the vicinity, wooded, and on its summit crowned by a remarkable tree. Massif Kandrani, about 355 feet high, and $3\frac{1}{2}$ miles S. by W. from it, has a well-defined summit, and is a useful mark when approaching from the north-eastward. The remarkable red cliffs of Ampajoni, $5\frac{1}{2}$ miles north-eastward of the entrance, have been already mentioned. Between Massif Katsépé and these cliffs will soon appear the land in the neighbourhood of Anorombato point, on which point is a fort, a lighthouse, and a conspicuous wireless telegraph tower. On Rova hill, covered with mango trees, half a mile south-eastward of the point, is a white building with a bell turret above a zinc roof showing conspicuously over the trees; it is a colombier or pigeonry used for military purposes, and is connected with Anorombato fort. Ambondro hill, 135 feet high and $2\frac{1}{2}$ miles eastward of the point, is also covered with mango trees. The town of Majunga occupies a large space of low ground at the southern foot of Rova hill, and Pointe de Sable projecting southward from the western end of the town, 8 cables within Anorombato point, affords some protection to the inner anchorage.

On Pointe de Sable, which consists entirely of sand, is a lighthouse and also the signal staff of the harbour authorities, 69 feet above the

General charts 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

sea, and there is a small jetty on its eastern side extending about S.E. $\frac{1}{2}$ S., a distance of 90 yards from the beach.

Ampangataha point, on the western side of the entrance, is 200 feet high, covered with trees, and on its seaward face, detached from the red cliffs of Katsépé, is a remarkable white patch like a sail. When seen eastward of South, the small detached rock of the same name as the point will be seen close off it.

Chart 378 and plan 701.

SHOALS.—Outside the entrance, but within the long line of banks on the Outer reef, are the following banks and shoals:—

Cavalier bank, with its southern edge about 3 miles off-shore on the western side of the entrance, extends N.W. by W., a distance of 7 miles from its shoalest spot of $1\frac{3}{4}$ fathoms, which is about one mile from its south-eastern extreme; this depth bears N.W., and is distant 6 miles from Ampangataha rock. A neck of deep water entering the bank on its south-eastern side, northward of the shallowest spot, almost divides it into two shoals. The least depth on the northern part is $3\frac{1}{4}$ fathoms, but in the middle of the southern part there is a large patch with $2\frac{3}{4}$ and 3 fathoms, and the general depth on the whole bank is from $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms.

Narcissus bank (*Lat. 15° 39' S., Long. 46° 14' E.*) is opposite the entrance to Bombetoke bay, and its southern extreme, in 5 fathoms, is only 3 miles outside it. Within that depth, it is 5 miles long North and South; but near its southern end is a part $1\frac{1}{2}$ miles long with only $2\frac{1}{4}$ fathoms, and one shallow patch of 7 feet, from which Anorombato lighthouse bears S.E. $\frac{1}{2}$ S., and is distant $5\frac{1}{2}$ miles.

Andriana shoal.—At $3\frac{3}{4}$ miles westward of the western entrance point, this coral reef projects nearly $1\frac{1}{4}$ miles from the coast near Andriana village, with $2\frac{1}{4}$ fathoms at its edge; this is a part of the fringing reef which lines the whole coast from Bombetoke to the next bay westward.

Plan 701, Bombetoke bay.

Antsahamingo rock, with 15 feet water, lies N.N.W. from Anorombato point lighthouse; it is within the 5-fathoms line extending from the shore, and has $6\frac{1}{2}$ fathoms just westward of it.

At 2 miles north-eastward of Anorombato point, shoal water stretches a long way off-shore in the direction of the rock just described; for the first 5 cables there are less than 10 feet water; for the next, from 12 to 15 feet; and the 5-fathoms line is upwards of $1\frac{1}{2}$ miles from the shore.

General charts 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

Buoyage.—Caution.—From time to time the shoals described, and even some of the Passes through the Outer reef, have been buoyed, but the whole of the buoys have disappeared and have not been replaced. It is certain that, whatever may be done in the future, for many years to come no dependence can be placed upon buoyage in this locality.

Depths.—Across the entrance, the depth is from 7 to 20 fathoms; and at 4 miles farther in the central channel, from 35 to 40 fathoms or even deeper; in the entrance there is a large space on the eastern side from $1\frac{1}{2}$ miles to 5 cables wide, with from 4 to 8 fathoms, but decreasing rapidly to $3\frac{1}{2}$ fathoms and less when abreast of Pointe de Sable.

Shoal water extends from Pointe de Sable W.S.W. for a distance of $2\frac{1}{2}$ cables, and midway between Pointe de Sable and Anorombato point the shoal water extends nearly 5 cables from the coast, but the eastern side of Pointe de Sable is steep-to, so vessels need not fear approaching it on that side.

The large bay, 5 miles wide, between Majunga and Ampirimpirina point, recedes more than 3 miles, has from 3 fathoms to 10 feet over a small space near the town, but nearly the whole bay, and considerably outside the line of its boundary points, either dries several feet at low water or has but from one to 3 or 4 feet over it. Several rivers flow into the eastern part of this bay through mangrove swamps. Abreast of Ampirimpirina point and to the southward for $1\frac{1}{2}$ miles as far as Antanandava point, where the land again falls back eastward in the inner bay, a drying shoal extends 8 cables from the shore; here, in mid-channel of the inner narrows, the depths are from 12 to 6 fathoms for an increasing width of nearly 2 miles, the width of the deep water in the outer part being only about one mile. At 2 or 3 miles beyond the inner narrows, the depths decrease gradually to the shallows of the estuary of the Betsiboka, and it must be borne in mind that the deposit from this large river is constantly and rapidly causing the shallows to grow outwards; so that, within a measurable number of years, it is quite probable that the inner bay will cease to exist.

Beacon (*Lat. 15° 46' S., Long. 46° 20' E.*).—In the shallow bay, southward of Majunga, is Ile Verte or Nosi Beza, a small island covered with trees. A beacon stands on the crest on the south-eastern part of the island; it is a conspicuous object, consisting of a triangular iron pyramid, surmounted by a white rectangular topmark $9\frac{3}{4}$ feet wide and 26 feet high.

The western coast is fairly bold for the first 3 miles from Ampangataha point, but during the next $6\frac{1}{2}$ miles to Maroloha point, ledges dry several feet at low water more than a mile from the shore.

General charts 378, 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

LIGHTS.—Katsépé head.—From a metal tower 103 feet high, on Katsépé cliffs, is exhibited, at an elevation of 394 feet above high water, a *white flashing light*, visible from a distance of 26 miles; the flash shows every five seconds for one tenth of a second.

Anorombato point.—From a tower 26 feet high, with black and white horizontal bands, on this point, is exhibited, at 118 feet above high water, a *fixed light*, showing *white, red, and green* sectors, the *white* sector being visible from a distance of 15 miles, and the coloured sectors 5 miles. The *green* sectors reported in 1902 to be very faint. For sectors, *see* Light list and charts.

Pointe de Sable (*Lat. 15° 44' S., Long. 46° 19' E.*).—From a tower 28 feet high, with black and white horizontal bands, on this point, is exhibited, at 33 feet above high water, a *fixed white light*, visible from a distance of 10 miles.

For arc of visibility, *see* Light list and chart.

Harbour light.—A small *fixed white light* is shown from the jetty-head at Majunga at about 10 feet above high water, and is a guide to small craft coming alongside the jetty. For arc of visibility, *see* Light list.

Wireless telegraph station.—A conspicuous wooden lattice-work tower, 180 feet high, is situated 170 yards south-east of Anorombato lighthouse.

Directions.—There are four channels by which Bombetoke bay may be entered, viz., the N.E., North, N.W., and West channels: the three first may be used by vessels of any size, the last is available for small vessels or those of moderate size with good local knowledge.

The N.E. channel is navigated by keeping Massif Kandrani bearing S. 40° W. When the houses of Majunga open out clear of Anorombato point, the Atsahambingo rock will have been passed; a vessel may then steer about S. by W. into the entrance, and haul up for the anchorage off Majunga, when the beacon on the summit of Ile Verte bears S. 37° E.

Entering by the North channel, steer for the summit of Massif Katsépé, bearing S. 21° W., until the western extreme of the Ampirimpirina promontory bears S. 5° E., when steer for it, passing at least $1\frac{1}{4}$ miles eastward of the Narcissus bank, until Ile Verte beacon bears S. 37° E., and then for the anchorage as before.

By the N.W. channel, steer for the western extreme of the same promontory bearing S. 19° E. and well open of Ampangatáha point; this leads between the Cavalier and Narcissus banks, one mile westward of the latter. When the south-western houses of the town bear S. 47° E., steer for them on that bearing until the beacon on the summit of Ile Verte bears S. 37° E., and then for it, and for the anchorage as before.

General charts 378, 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

The West channel, between the Cavalier bank and the coast reef, is navigated by steering for the centre of Ambondro hill bearing S. 73° E. This bearing, correctly kept, leads through in not less than 4 fathoms for a width of fully one mile.

Caution.—When either of these channels is taken *on the ebb*, it is not unusual to see many red or discoloured patches in the channel, whilst the water on the reefs and banks appears much clearer; this need cause no alarm, as it is occasioned solely by the muddy waters discharged from the rivers.

By night.—The establishment of reliable lights at this port, especially that at Anorombato point with coloured sectors, as already described, should render the anchorage at Majunga almost as easy and safe of attainment by night as by day. *White* sectors lead through the N.E., North, and West channels, but not the N.W. channel.

Anchorage (*Lat. 15° 44' S., Long. 46° 20' E.*). — Having entered by one of the channels described, proceed as directed towards Île Verte, the beacon on its summit bearing S. 37° E., until the white house or Pigeonry on Rova hill bears about N. 28° E. and is in line with Pointe de Sable; the depth will then be about 5 fathoms; then haul up for the point and anchor in about 4 fathoms, stiff mud, with Anorombato point lighthouse, over the rise of the wharf, bearing N. 12° W. and the Pigeonry on Rova hill in line with the right hand side of the bottom of the road that ascends Rova hill; this latter direction is not very clear. Ambotifoty (Ambohofity) hill cannot be seen from the anchorage, as it is screened by high trees. The tidal streams are strong at this anchorage, the ebb running 3 knots, at springs, but the closer a vessel can approach the shore the less will the stream be felt.

Vessels desiring to anchor farther up in the inner bay, off the Delta of the Betsiboka, if leaving the anchorage off Majunga, should stand to the westward at once to clear the shoal water in the eastern bay, which may be done by a careful use of the lead and by bearings of Maroloha point; proceed through the channel on a bearing of that point: when Antanandava point bears East, turn to the eastward and anchor as convenient in from 8 to 4½ fathoms, mud, and good holding ground.

Tides and Tidal streams.—It is high water, full and change, at Majunga, at 4h. 45m.; springs rise 12½ feet, neaps 8¾ feet. At Maroloha point, in the inner bay, the tide is 12 minutes later: here, springs range 14¾ feet, and neaps 6½ feet. At the anchorage for large vessels off Majunga the flood runs 2 knots, the ebb 3 knots. During the rainy season the flood stream, at neaps, sometimes becomes obliterated; at such times, the surface water at the anchorage is sufficiently fresh and

General charts 378, 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

good to be used for washing clothes. In the entrance of the bay, the tidal streams are always strong.

MAJUNGA (Mojanga) (*Lat. 15° 44' S., Long. 46° 26' E.*).

—This important town, built partly on a ridge overlooked by the Rova, formerly the residence of the governor under the Hova régime, but mainly on lower ground facing southward, extends nearly a mile along the coast. Besides the jetty already mentioned at Pointe de Sable, an iron pier has now been erected, and an extensive system of wharfage is in course of construction. A British and an American Vice-Consul are resident here.

The population of Majunga in 1910 was 3,461, of whom 966 were Europeans; it is the capital of the province of that name, the population of which, in the same year, was 83,296, of whom 2,657 were Europeans or Asiatics.

Of the number of villages which formerly stood around the bay, only two remain; Katsépé, on the western side, 3 miles within the entrance, inhabited by a few Sákaláva fishermen; and Ambatolampi village, on the slopes which border the river of that name, eastward of Ile Verte.

Communications.—For Mail and Telegraph services, *see* pages 24, 25. Majunga is visited by many trading steamers from Zanzibar, Aden, and Bombay; and by smaller vessels from Nosi Bé, the Comoro islands, Morondava, and Nosi Vei. A small steamer of the Messageries line calls twice a month, touching also at Nosi Bé, Nosi Vei, and Maintirano. The Messageries mail steamers that leave Marseilles the 10th of each month are due at Majunga the 1st or 2nd of the following month, and the homeward bound mail is due on the 23rd of each month. The Betsiboka may be navigated in all seasons as far as Marololo, and for most months of the year as far as Maevatanana, a distance of 152 miles, by shallow-draught boats. There is a regular service of small steam boats between Majunga and Maevatanana. From Maevatanana to the capital there is a good road, and a monthly service of motor-cars. There is also a good mail road from Majunga to Antananarivo, as well as telegraphic communication, *see* page 234; and by submarine cable with Mozambique.

Trade.—The principal articles of export are rice, hides, bees' wax, and rubber. In 1910 the value of imports was £232,388, exports £341,979. The vessels which entered in 1910 were 2,115, of a total tonnage of 207,864 tons; this represents 14 per cent. of the total shipping of Madagascar.

Supplies.—Good water is supplied on application to the captain of the port. Cattle may be had in any number; turkeys, fowls, &c., are plentiful; rice and green vegetables may be obtained, but the latter are scarce.

Coal.—A small quantity may generally be obtained by lighter.

General charts 378, 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

Climate.—See table in Appendix I.

River Betsiboka.—This river takes its rise in the mountains northward of Antananarivo. The Ikopa also has its source in the mountains near Antananarivo, flows past the southern side of that city, and, traversing the province of Imerina, joins the Betsiboka about 100 miles from its mouth at the head of Bombetoke bay. Though in their upper parts these rivers flow through a rugged country, and while traversing successively the terraces of the mountain range from many rapids and falls, they, and especially the Ikopa, are still much used for the conveyance of heavy goods to the capital, though these obstructions necessitate frequent transshipment and portage.

The delta of the Betsiboka is occupied by a vast belt of mangroves intersected by numerous streams cutting the area up into a labyrinth of sandy and marshy islands, on which it is almost impossible to effect a landing. Three principal streams form the three several mouths of the river, viz., the Mahabo or Kandranikeli on the West, the Morakari in the middle, and the Manana or Ambatokeli on the East. The last named is the principal entrance channel by which, as before stated, small steamers ascend for 200 miles.

Although as far as the north-western end of Nosi Lava, about 7 miles from the anchorage in the inner bay, nothing less than 2 fathoms has been found in this channel; it is so subject to change from freshets, &c., and so devoid of marks, that without local knowledge it should only be used at high water, after buoying it at low water. Boats may take the Mahabo channel, where they are protected from south-easterly winds, which often raise a dangerous surf for such craft.

In proceeding by the Manana channel (*Lat. 15° 53' S., Long. 46° 27' E.*), the banks being bordered by mangroves, no good landing will be found before reaching Maevarano, 13 miles above the inner bay anchorage; here, there is a very convenient landing place sheltered by a rocky point. Above this, sandbanks cause the channel to be deflected from one side to the other, and occasionally cause bars, reducing the depth for the whole width. This mangrove growth ceases about 10 miles above Maevarano, where the small River Andra Nolava debouches. At 2 miles higher, the River Marovoai, so called because of its swarming with crocodiles, enters the main stream; this river is only from 20 to 30 yards wide, has from 6 to 12 feet water, no shoals, and has the appearance of an artificial canal. For about 2 miles, to Mahatsinjo, the banks are wooded: above this, for 3 miles to Marovoai village, they are almost bare, and landing easy, at high water.

Marovoai was an important trading and fortified village under Hova rule, with a population of about 5,000: it still remains by far the most

General charts 378, 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. 8° 20' W.

important place in this district, being a centre of the cattle and rice producing country. The Rova Hova overlooks the village from a hill about 150 feet high. The only two villages above Marovoai on the right bank are Miadana and Marodabo, neither being of the least importance.*

* On June 26th, 1876, the boats of the *Flying Fish* and *Thetis* left Majunga and ascended the River Betsiboka as far as Madraval village, which was reached on the 28th; the following is a narrative of that expedition:—

The distance by the windings of the river is about 100 miles, but in a direct line S.S.E., it is probably but little more than half that distance. From leaving Majunga until 5 or 6 miles past the entrance to Marovoai creek, that is to say, about 35 miles from Majunga, the banks present the same monotonous line of mangrove swamp, covered by trees fantastical and interesting individually, but collectively presenting a continuous line of green of the same shade and height, which mile after mile became wearisome.

The stream was affected by the tide about 60 miles up, that is, about 30 miles above Marovoai creek; higher up there was a continuous down stream of 2 knots. A small rise and fall was experienced 100 miles up. From the appearance of the banks the river must be about 8 feet higher during the rainy season than during the dry weather; the former causes the stream to rush down with great velocity, carrying away portions of the bank, trees, &c. From Majunga to Marovoai the navigation of the river is easy at any season, $1\frac{1}{2}$ to 2 fathoms being found in the dry season; but above Marovoai creek it is intricate and tortuous, and even a boat may have difficulty in finding sufficient water during the dry months.

After the 35 miles had been passed the mangrove disappeared, the country became open and pleasant to the eye; large valleys of pastureage divided the numerous well-wooded hills, sometimes covered with fine trees. The river banks at this upper part were 6 to 10 feet high, affording convenient landing places, and here and there a small hill is found abutting on the river. We found, however, that there is much marsh in the valleys, between the firm land adjacent to the river and the distant hills, and that the path must be followed carefully.

Marovoai is a Hova town standing a few miles from the entrance of a small creek which joins the river on the north side, about 30 miles above the town of Majunga. The fort is built on a small hill about 50 feet high, which possesses the natural advantage of presenting steep cliffs in all but one direction. They have a number of guns; chiefly old 32-pounders; very few mounted and serviceable. The town is on the bank of the creek at the foot of the hill on which the fort stands; it is larger than most towns in these parts, and has a considerable population, comprised of Hova soldiers, Hindoos, Banyans, Arabs, and Sakalavas. The three foreign races are principally engaged in trade. The imports are cloth, guns, knives, glass, beads, &c., and the exports are hides for foreign markets, rice, salt, &c., for local trade, to places on the coast. The governor of Marovoai received the officers with the ridiculous formalities usual with the Hovas, but those over he appeared hospitable and intelligent; his house was large and airy.

Madraval was the only other village of importance seen by us at the highest point reached in the boats; it is inhabited by Sakalavas, but is doubtless under Hova rule. It is pleasantly situated at the foot of a range of small hills, over $1\frac{1}{2}$ miles from the western bank of the river. Near the town and extending several miles there are well-kept rice fields, which, with the number of people employed in them, formed a pleasing picture of industry compared with the usual idleness of the natives. From the river large herds of cattle were frequently seen; guinea-fowl and other birds were numerous, affording excellent sport. Alligators abound in the river, and are said to destroy many persons annually. Small hamlets of natives' huts are scattered along the river's bank, and near them small patches of cultivated ground, sufficient to satisfy their humble requirements.

General charts 758, 759a, 597, 748a, b.

Plan 701, Bombetoke bay. Var. $8^{\circ} 20'$ W.

Tides and tidal streams.—As the Betsiboka is ascended, the tides become later and the range less. At Marovoai, it is high water, full and change, about 7h. or $2\frac{1}{4}$ hours later than at Majunga; springs rise $11\frac{3}{4}$ feet, neaps 5 feet. Tidal influence is felt 30 or 40 miles above this, but during the rainy season it is counteracted by freshets. At the Manana mouth, the ebb runs 4 knots, and probably more during freshets.

Chart 378, Maromanjo point to Makambytra bay.

Coast.—Between Katsépé cliffs and Cape Tanjona, with the exception of Makambi island standing well out from the land, the coast presents no remarkable feature, and shoal water extends from one to 4 miles from it, drying as much as 4 feet right out to Makambi island, between which and Cape Tanjona many shallow rivers find their way to the sea through mangrove swamps, coral reefs, and mud flats drying from 6 to 4 feet $2\frac{1}{2}$ miles off-shore. From the Namakia river, the most western of these streams, the land rises gradually towards Cape Tanjona, 6 miles distant from it.

Boina or Makambi bay opens out south-eastward of Makambi island; the broad space at the entrance is nearly closed by extensive coral banks and shoals, either dry, or nearly so, at low water. There are, however, two narrow, tortuous, and difficult channels through the reefs into the bay, of which the eastern is the deepest. By this channel, the course is at first about S.E.; it then turns sharply to S.W., and in making the turn, a bar, with about 16 feet water, has to be crossed; but, with this exception, so long as a mid-channel course is maintained, the depths are from $4\frac{1}{2}$ to 9 or 10 fathoms. By the western channel, nothing less than 12 feet was found at the last French survey.

The great difficulty in entering by either channel is the entire absence of marks, and no vessel should attempt it without first marking the channel either by buoys or boats.

Makambi island (*Lat. $15^{\circ} 43'$ S., Long. $45^{\circ} 55'$ E.*) is 19 miles westward of Katsépé cliffs; it is 236 feet high, surrounded on all sides by a fringing coral reef of small extent, and is a bare, narrow plateau $1\frac{1}{2}$ miles long, N.N.E. and S.S.W., falling precipitously on each side, but terminating northward in a somewhat gentle slope, and continuing southward with several small hillocks; at the southern end, as before explained, it is connected with the shore $2\frac{1}{2}$ miles distant by a drying bank. The island is uninhabited and offers no resources; it is composed of volcanic matter, with some parts of bright red colour, and is visible in clear weather from 15 to 18 miles.

Tides.—It is high water, full and change, at Makambi island, at 4h. 27m.; springs rise 11 feet, neaps $7\frac{3}{4}$ feet.

General charts 758, 759a, 597, 745a, b.

Chart 378, Maromanjo point to Makambytra bay. Var. 8° 30' W.

Anchorage.—The approach from either northward or eastward is clear, and good anchorage in from 5 to 6 fathoms, mud, well sheltered from south-easterly winds, will be found with the north-eastern extreme of the island bearing N.W. distant from one to $1\frac{1}{2}$ miles.

Between N.W. by W. and West from the northern end of the island, a bank of sand and coral, with less than $3\frac{1}{4}$ fathoms in some parts, extends fully 6 miles. Between this bank and Cape Tanjona, there is good anchorage anywhere in 5 fathoms or less, and the shoaling towards the shore is very gradual until the 3-fathoms line is crossed.

CAPE TANJONA (*Lat. 15° 47' S., Long. 45° 41' E.*) is 14 miles westward of Makambi island, and in the bay between, as also westward of the cape, the water is everywhere shallow. The land at Cape Tanjona takes the form of a plateau with a division, causing it to appear from seaward as two islands close together; the northern and highest part being 351 feet above the sea, with a flat summit. The southern part slopes at first, and then falls suddenly. Some smaller eminences appear farther southward.

Cape Tanjona should not be approached too closely, as the 5-fathoms line passes $1\frac{1}{2}$ miles northward of it. At $4\frac{1}{2}$ miles E. by N. $\frac{3}{4}$ N. from the cape the depth is only $4\frac{1}{4}$ fathoms, and at $3\frac{3}{4}$ miles W. by N. $\frac{1}{2}$ N., $4\frac{1}{2}$ fathoms.

A small 5-fathoms coral shoal lies detached, with Cape Tanjona bearing S. $\frac{3}{4}$ W., distant 4 miles. Depths of $5\frac{1}{2}$ and 6 or 8 fathoms lie around this bank.

Supplies.—In the plain south-eastward of Cape Tanjona, cattle can be procured; also fresh water, at or above half-tide, from a little rivulet which descends from the plateau and runs into the sea nearly 2 miles eastward of the cape.

Charts 378, 758.

Coast.—From Cape Tanjona to Cape Amparafaka, W. by S. $\frac{1}{4}$ S. distant 26 miles from it, the coast recedes southward, and at each end forms the two deep inlets of Maroambitsi and Boyanna. Between Cape Tanjona and Maroambitsi, the coast is bordered by fringing coral reefs covered with sand brought down by the numerous rivers which flow into the head of this bay. These banks, over which the depths are only a few feet and very irregular, are steep to at their outer edge, and are not marked by any change in the colour of the water; they should therefore be approached with great caution.

Westward of Maroambitsi bay, the coast is low and covered thickly with brushwood, but at 2 miles inland and near other hillocks westward of it, rises Boteler hill to a height of 197 feet, at present sur-

General charts 759a, 597, 748a, b.

Charts 378, 758. Var. 8° 30' W.

mounted by four large trees. Sada point, 136 feet high, on the eastern side of the entrance to Boyanna bay, may be known by its regular shape and white cliffs.

Between Maroambitsi bay and Sada point, sand and coral banks and reefs extend 2 miles off-shore; beyond which, for at least 2 miles, the depth is less than 5 fathoms.

Chart 378, Maromanjo point to Makambytra bay.

Maroambitsi or **Makambytra bay**.—The large space which forms the outer part of the bay is occupied by an immense and almost impassable shoal; the bay is, in fact, only a large estuary into which the Boteler and other rivers, thickly bordered by mangroves, empty themselves. A narrow channel leads through the shoals to the head of the bay, where there is deeper water, but it is barred by a sandbank with a depth of $1\frac{3}{4}$ fathoms over it. The mouths of the rivers are all barred by sandbanks. The outer part of the bay is 6 miles wide, but it contracts rapidly to $1\frac{1}{2}$ miles where the rivers join it.

Plan of Boyanna bay on 708.

BOYANNA or **BALI BAY**.—**Sada point**.—The entrance to this bay lies between Sada point on the East and Cape Amparafaka on the West, which bear from each other N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E., and are $5\frac{1}{2}$ miles apart; the actual width abreast of Sada point is $4\frac{1}{2}$ miles, and the bay recedes from thence to its head $8\frac{1}{2}$ miles in a S.S.W. direction. The reef eastward of Sada point consists of several coral banks, of which nearly all the heads uncover at low water; it cannot always be distinguished by discoloured water, nor does it always break, and at 2 miles eastward of the cape, it extends fully $1\frac{3}{4}$ miles off-shore. A shoal with as little as $2\frac{1}{4}$ fathoms water extends W. by N. a distance of 2 miles from Sada point; and, within the bay, a large flat extends 2 miles from this point and from the eastern shore, and dries almost to its edge westward of Marotia point.

Cape Amparafaka, or Bararata point (*Lat. 15° 57' S., Long. 45° 16' E.*), is 98 feet above high water, and consists of reddish cliffs, surmounted by palms. From it the land on the western side of the bay rises, and is covered with thick brushwood, and at 7 miles S. by W. from the cape is a conspicuous round tree on a hill, 218 feet high; whilst about 10 miles southward of the cape, at the head of the bay, near the village of Soalala, above some red cliffs crowned with trees and almost at the very edge is a remarkable tree, the top of which, 103 feet above the sea, shows darkly against the background.

Vigilant bank, with general depths of from $3\frac{1}{4}$ to $4\frac{1}{4}$ fathoms, extends $2\frac{3}{4}$ miles eastward from Cape Amparafaka. Shoal

General charts 758, 759a, 597, 748a, b.

Plan of Boyanna bay on 708. Var. 8° 30' W.

water also continues up the western shore of the bay, extending about $1\frac{1}{4}$ miles from it.

Depths.—In the fairway of the entrance there are from 6 to 9 fathoms, and nothing less than 5 fathoms need be encountered until Marotia point bears eastward of E.S.E.; from this position southward the bay becomes very shallow, and indeed is almost wholly occupied by banks scarcely covered, and drying as much as 5 or 6 feet in many large patches, at low water. Within Sada point is an extensive lagoon formed by a neck of land curving southward and south-eastward to Marotia point, on which stands the village of that name. The entrance of the lagoon is barred, the inner part is mostly covered by sandbanks, and its shores occupied by mangrove swamps.

Directions.—To enter Boyanna bay, bring the tree on the summit of the hill on the western side of the harbour to bear S.W. $\frac{1}{2}$ S., and steer for it until the North extreme of Sada point bears E. by S., then steer for the remarkable tree near Soalala, bearing S. $\frac{3}{4}$ E. If entering on the flood tide, guard against being set eastward towards Sada point.

Anchorage should be taken up by a large vessel in 7 or 8 fathoms before Marotia point bears E.S.E., but small vessels desiring to communicate with Bali and other villages may proceed farther up the bay and anchor in $3\frac{1}{4}$ fathoms, with the flagstaff at Bali bearing S.W. by W., and the tangent of the near western shore N.N.W. $\frac{1}{2}$ W.

Landing cannot be effected in front of Bali village at low water; it is then necessary to go to Oyster point, the rocky projection southward of Bali, from whence it is only 5 or 6 minutes' walk to the cottages.

Tides and Tidal streams.—It is high water, full and change, in Boyanna bay, at 4h. 33m.; springs rise $10\frac{3}{4}$ feet, neaps $7\frac{1}{4}$ feet. The ebb stream runs 2 knots at springs.

Supplies, trade, &c.—Soalala, Taranta, Marotia, and other villages around the bay have a considerable trade in cattle with the Comoro islands, and bullocks can always be purchased at reasonable prices. Poultry and eggs may be obtained. Game is plentiful, especially guinea-fowl and partridges. Sweet potatoes and pumpkins are abundant in the season, and fish may be caught with the seine. At Bali, where many Arabs live, kids are generally procurable.

Chart 758, Cape St. Andrew to Antongil bay.

River Ranomavo (Andranomavo) (*Lat. 16° 5' S., Long. 45° 20' E.*).—This river flows into the head of Boyanna bay; in 1874, the *Flying Fish* sent a steam cutter more than 8 miles

General charts 758, 759a, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 8° 40' W.

up. The bar was nearly dry at low water springs; inside there were 2 fathoms, and in some places from 3 to 4 fathoms. The course during the first 7 or 8 miles is very winding, between mangrove swamps, without any sign of habitation and very little animal life; a few curlew and other fishing birds only were seen. Above 8 miles, the river flows at the foot of a hill about 200 feet high, and there was a village, supposed to be a new settlement. The natives were with difficulty induced to approach; they stated that the river is navigable two days' journey higher up—probably 20 miles. The hills were covered with ebony trees.

COAST.—Between Amparafaka point and Cape St. Andrew, about 50 miles to the westward, the trend of the coast forms a large but slightly receding bay; for the first 23 miles the land rises to a considerable height, with a succession of red sand cliffs and sandy beach. From the entrance of Bikaoki river westward, across the broad and far receding estuaries of the Behara, Fola, and Manombo rivers, banks of coral and sand, on which the sea breaks almost continuously, extend from one to 3 miles from the coastline. From thence to Cape St. Andrew, the coast is bordered by sand and coral banks, extending in places nearly out to the 5-fathoms line, and as much as 3 miles off-shore. The large village of Belobaka, of which the principal inhabitants are Arabs, though the neighbouring population is Sakalava, is on the coast just westward of the broad estuary described; at 4 miles westward of it, and 8 or 9 miles eastward of Cape St. Andrew, is the Kasenji river (*Lat. 16° 10' S., Long. 45° 24' E.*), only accessible to the boats of the country. At 1½ miles N.E. by E. of Kasenji river entrance, a coral patch uncovers 3 feet at low water; and about 5 cables off-shore, north-westward of that river, two coral patches uncover 5 and 7 feet.

Off this part of the coast, at certain seasons and in calm weather, the sea is often found covered for miles with a yellowish oily substance which, under the action of a breeze, breaks up into large patches; from the changes thus caused in colour of the water, this might be thought to indicate the presence of shoals. The cause, however, is the diffusion of the seed of the mangrove washed out of the various rivers. This substance is found to have a strong scent resembling linseed.

Southward of the River Bikaoki and some distance inland are several hills of a yellowish colour, and generally wooded on their summits, the highest being over 700 feet; and away westward are higher continuous ranges running N.N.E. and S.S.W., parallel with the coast southward of Cape St. Andrew. The most remarkable objects, however, in this neighbourhood are the Ambohitrosi moun-

General charts 759a, 597, 748a, b.

Chart 758, Cape St. Andrew to Antongil bay. Var. 8° 40' W.

tains, two conspicuous cones, the northern and highest being 2,520 feet high, and the southern 2,051 feet; between them is another smaller peak; they lie about 34 miles from the coast.

Lynx reef (*Lat. 16° 10' S., Long. 44° 36' E.*) is about 8 miles eastward of Cape St. Andrew, and $1\frac{8}{10}$ miles off the nearest coast; it is within the 5-fathoms line, gives no indication of its presence by discoloration of the water, only breaks at intervals when covered, uncovers 5 feet at low water springs, and being relatively steep-to, should be given a good berth in passing.

Vilamatsana is a considerable village, about 2 miles eastward of Cape St. Andrew, at the entrance of a creek in which dhows and other small craft anchor. The entrance may be known by two little sand dunes on its eastern side, on which are clumps of casuarinas; these show well when seen bearing between S.W. by S. and S.S.E. There is no very recent information regarding this place, but it is stated that the inhabitants are chiefly Arabs, that there are $1\frac{3}{4}$ fathoms over the reefs at the entrance at high water, and that it is much deeper inside. The channel runs in a S.S.W. direction, with heavy breakers on each side; it should be approached from the north-eastward, by keeping close along shore.

Dowding banks are those which cause the heavy breakers just described; they consist of sand and coral, and extend $1\frac{1}{2}$ miles from the shore, forming an arc of a circle to seaward, from which direction they are steep-to and have no opening, but the small craft frequenting the place pass through the breakers at high water; this should not, however, be attempted by a stranger. In 1883, it was remarked by H.M.S. *Osprey* that there was no discoloration of the water distinctive of the outer rocks of these banks.

Supplies.—Cattle and poultry were obtained here after giving notice in time to have them brought from the country. Vegetables are, as usual, scarce. Dhows take bullocks to Mozambique, which is the chief trade.

Grenouille bank.—This bank is probably the north-western termination of the long line of outer reefs. The least water shown on the chart is $6\frac{1}{2}$ fathoms, but less water may be found, as the survey is incomplete, and the *Grenouille*, who discovered this bank in 1851, reported a least depth of $4\frac{1}{2}$ fathoms. See also page 398.

General charts 759a, 597, 748a, b.

CHAPTER X.

WEST COAST OF MADAGASCAR.—CAPE ST. ANDREW TO CAPE ST. MARY.—ISLANDS AND DANGERS IN MOZAMBIQUE CHANNEL.

(*Lat. 16° 10' S. to Lat. 25° 40' S.*)
(*Long. 45° 10' E. to Long. 39° 0' E.*)

VARIATION IN 1911.—Decreasing 5' to 8' annually.

Chart 597, Delagoa bay to Cape Guardafui. Var. 9° W.

GENERAL REMARK.—The western coast of Madagascar under consideration in this chapter is fully 770 miles in extent, and comprises within its limits perhaps that portion which having hitherto been of the least importance to Europeans is also the least known. The coastline is far more irregular than that on the eastern side of the island, almost as deficient in good harbours, and still more so in population, civil wars and tribal quarrels having in many parts depopulated whole districts. Probably under its new government, as the general condition of the country revives, and its trading wants and all which that involves become better known, so the general knowledge of its coast will increase.

Chart 759a, Cape St. Andrew to Bevaro island.

CAPE ST. ANDREW (Vilanandro) (*Lat. 16° 12' S., Long. 44° 28' E.*), the north-western extreme of Madagascar, consists of level sandy ground covered with palms and other vegetation, ending in a low bare sandy point, on which is the small village of Bevilana, with two flagstaffs; from the cape, the land on the northern side trends E. by N. about 2 miles to the low point forming the entrance to Vilamatsana, described at page 412; and, on the southern side, the trend of the coast is about S.W. by S. for the first 10 miles. Two small clusters of tall trees grow about 160 yards eastward of the point, and may be seen 5 or 6 miles distant in a clear night; but the best mark by which to identify the cape is a single large casuarina tree about 3 miles southward of it.

The cape is enclosed by a series of wide shallow banks, extending a long way off, especially towards the West, on which the sea always breaks heavily. The bank westward of the cape has been lately

General charts 597, 748a

Chart 759a, Cape St. Andrew to Bevato island. Var. 9° W.

examined, and as all authorities had supposed has become shallower, and should be avoided; a general depth of from 5 to 7 fathoms exists at 10 or 12 miles between W. by N. and W. by S. from it, but two dangerous reefs, now to be described, are known to exist on the outer part of the bank, and there may be others; therefore, when passing westward of the cape, give it a berth of from 12 to 15 miles.

Vulture shoal (*Lat. 16° 13' S., Long. 44° 22' E.*) is about $2\frac{4}{10}$ miles in extent and circular in form; the least depth is 9 feet, sand, but its surrounding depths are only 2 and $2\frac{1}{2}$ fathoms, and there is no channel between it and the coast. From the shoalest spot, Bevilana village bears E. $\frac{3}{4}$ S. distant about $6\frac{1}{2}$ miles.

Milanja bank lies about 8 miles from the coast, and $4\frac{1}{2}$ miles south-westward of the Vulture. This danger is about 4 miles long N.N.E. and S.S.W., with 14 or 15 feet water at each end, but only 2 feet over it, near the centre, which lies with Bevilana bearing N. 71° E. distant $11\frac{2}{10}$ miles. There appears to be about 3 or 4 fathoms immediately in-shore of this shoal and 6 or 7 fathoms close outside it.

Between Chesterfield island and the Milanja bank, the bottom is very regular, the depth decreasing gradually until within 12 miles of the land where it is from 10 to 12 fathoms. From thence the decrease is more rapid.

PRACEL BANK.—This large space of shoal or irregular soundings borders the coast from the latitude of Cape St. Andrew to about lat. 19° S. The width of no part has as yet been ascertained with accuracy, but on the parallel of lat. 16° 10' S., a line of soundings shows as little as from 12 to 18 fathoms in long. 43° 8' E., or 76 miles westward of Cape St. Andrew, and in lat. 16° 45' S. the bank extends 60 miles westward of the land; between these parallels, there appears to be a large area in which, at from 45 to 75 miles from the coast, no bottom has been obtained with from 100 to 145 fathoms of line. Southward of lat. 17° 20' S. the bank contracts gradually, so that abreast of the Barren islands it is not more than from 16 to 18 miles wide. The soundings in many parts indicate a very uneven bottom, principally sand and coral; the dangerous places, as far as known, will be described, some being upwards of 30 miles from the coast. The seaward sides of the bank are very steep, the depth increasing from 20 or 25 to 50 or 60 fathoms, and sometimes beyond 130 fathoms within the space of one or two miles.

Currents, &c.—The currents over the Pracel bank are very perplexing and uncertain, generally running from one to $1\frac{1}{2}$ knots, sometimes north-eastward and sometimes in the opposite direction, without any apparent reason.

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 9° W.

Unless vessels are bound to some part of the coast within this bank, they should keep outside it altogether in navigating the Mozambique channel, and in the event of the soundings showing that they are on its outer edge, they should haul to the westward at once into deep water.

Chesterfield island (*Lat. 16° 19' S., Long. 43° 58' E.*) is a sandbank rising 12 feet above the sea, of which the centre is about 33 miles West from Cape St. Andrew, it is about a mile in extent and rests on a bed of rock, of which a black mass shows on the western side and contrasts boldly with the surrounding reddish-coloured sand; it can be seen from the deck 6 or 8 miles distant. A reef surrounds the island, extending from $3\frac{1}{2}$ to 4 miles westward; the bank on the eastern side is of reddish sand, with a rock showing just below the surface at 5 cables from the island; on these reefs the sea breaks heavily. Depths of 5 fathoms or less extend fully 2 miles southward, and more than 5 cables northward and eastward of the island. In passing southward of it, a berth of at least 2 miles should be given; and, at night, it should not be approached, for even with a bright moon it cannot be seen at so great a distance as the dangers extend.

Tidal streams.—Between Chesterfield island and Cape St. Andrew the tidal streams are usually regular, the flood setting southward, the ebb northward. Occasionally, as before remarked, a current will overcome the tidal streams and set steadily for some time in one direction.

Observations of the tidal streams between Chesterfield island and Beravina were made in July, August, and September, but the results were not very satisfactory; however it was found that the maximum rate was $1\frac{2}{10}$ knots. The ebb stream runs to the westward between North and S.W., being at its strongest 4 hours after high water; the flood stream runs to the eastward between North and South, being at its strongest 3 hours before high water.

Vestal shoal.—This shoal was discovered by H.M.S. *Vestal* in 1879. It lies 12 miles S.S.W. $\frac{1}{2}$ W. of Chesterfield island, and is about $3\frac{1}{2}$ miles long North and South by 2 miles in width; it has a least known depth of $3\frac{1}{4}$ fathoms near its north-eastern end, and from 4 to $5\frac{1}{4}$ fathoms over the remainder. Close around are depths of from 8 to 18 fathoms.

Flying Fish bank, 6 miles eastward of Vestal shoal, has a least depth of 8 fathoms over it.

Dart rocks.—These rocks, found by H.M.S. *Dart* in 1853, lie S.E. a distance of 13 miles from Vestal shoal; they dry 5 feet at low water.

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Berato island. Var. 9° 20' W.

Mpanjaka shoal has several heads with less than 6 feet, but it seldom breaks except with strong south-westerly winds; one head with only 3 feet lies S. $\frac{1}{2}$ W., distant 15 miles from Dart rocks. From this position, rocks extend 7 cables north-westward and 4 cables in a south-westerly direction.

Kiakala or Porpoise reef.—This coral reef has several heads which uncover, one as much as 6 feet; it lies S. by E. $\frac{1}{2}$ E., distant 3 miles from Mpanjaka shoal, with which it is connected by depths of $5\frac{1}{2}$ to 6 fathoms.

Between Mpanjaka shoal and Dart rocks there are depths of from 13 to 15 fathoms.

The passage between these reefs and the coast is reported to be perfectly safe.

Westward of Kiakala, a distance of 24 miles, is a bank with a least known depth of 6 fathoms over it, and about 17 miles further in the same direction is another shoal of 7 fathoms.

JUAN DE NOVA (*Lat. 17° 3' S., Long. 42° 46' E.*).—This low sandy island, belonging to France, lies about 25 miles westward of the Pracel bank, with which it has no connection. It is about $2\frac{1}{2}$ miles long E.S.E. and W.N.W., covered with trees, especially at its eastern end, is about 15 feet above the sea level, and is surrounded by reefs which prolong its length eastward and westward by more than 3 miles, uncovering at low water for about 1,400 yards at each end. A bank with from 5 to 7 and 10 fathoms extends 4 miles northward and north-eastward of the island, which appears, however, to be fairly steep-to on its southern side. On the northern side is a collection of huts inhabited during the winter months, July to February, by turtle and shell fishermen, and also a solitary conspicuous cocoanut palm, which is visible from a distance of 10 miles.

Beacons.—On the western end of the island is a beacon with a rectangular topmark, and on the eastern end one with a triangular-shaped topmark, base downwards.

Wreck.—The wreck of the s.s. *Tottenham*, dry at low water, is situated on the south side of the island at a distance of about $1\frac{1}{2}$ miles S. 33° E. from the beacon on western extreme of island. It is visible from a distance of 15 to 16 miles.

Anchorage.—The best anchorage is on the bank extending northward from the island, about 3 miles north-eastward of its western end, and care should be taken to avoid the numerous coral patches, which, in calm weather, show up dark and clear. The holding ground is, however, bad, and if the wind comes from the northward a vessel should be prepared to weigh at once. The turtle fishers secure their

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 9° 30' W.

boats inside the reef at the western end of the island, and also in a small creek at the south-eastern part.

Landing.—The northern side is rocky, and there are some patches, steep-to, on which the sea breaks at low water more than a mile off-shore, but there is smooth water between the heads, allowing a free passage for boats. In calm weather, there is no surf on the shore on this side, and boats can land easily and lie on the beach at any time of tide.

Tides.—The range of tide at Juan de Nova is at least 10 feet.

Supplies.—During the breeding season, sea-birds' eggs may be obtained by thousands, and if wanted, the birds may be killed with sticks, though they are reported to be less numerous than formerly; fish may be taken with hook and line. A little maize is grown on the island; water is scarce and brackish; vegetables or other supplies are altogether wanting.

Shoal water may exist some 30 miles S. by W. $\frac{1}{2}$ W. from Juan de Nova in about lat. $17^{\circ} 35'$ S., long. $42^{\circ} 42'$ E., where the Captain of the *Fabert*, in 1879, reported his vessel being struck by a heavy sea during moderate weather.

Chart 597, Delagoa bay to Cape Guardafui.

A 10-fathoms patch is charted in lat. $18^{\circ} 10'$ S., long. $42^{\circ} 16'$ E., or about 45 miles south-westward of the position assigned to the doubtful shoal just mentioned.

A bank, with depths of from 24 to 25 fathoms, is reported to exist in about lat. $18^{\circ} 18'$ S., long. $41^{\circ} 41'$ E., the position being indicated by discoloured water and overfalls.

Chart 759a, Cape St. Andrew to Bevato island.

COAST.—**Cape St. Andrew to Manambolo river.**—This portion of the western coast of Madagascar is about 165 miles in extent. It is generally fringed by coral reef, large masses uncovering at low water and sometimes presenting very curious shapes; these reefs are particularly dangerous, as the water, discoloured by the numerous streams, prevents their being seen, and there is usually deep water close to them. This coast is, however, but imperfectly known as regards the greater part. Such information as is available is now given before proceeding to describe the outlying shoals and islands.

Southward of Cape St. Andrew, the coast is nearly all low with a sandy beach, uniform, and generally covered with trees, which can be seen at a distance of 8 or 10 miles. About 3 miles southward of the cape is the large casuarina tree before mentioned, and about 3 or

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 9° 30' W.

4 miles and again from 10 to 15 miles inland are low hills running parallel with the coastline; but about 25 miles inland is the remarkable mountain, Ambohitrosi, described at page 411, visible from opposite Boyanna bay, round by West as far South as Porpoise reef. It can be seen long before the coastline, and is almost the only good landmark about this part. The whole of the western coast of Madagascar is intersected by numerous rivers, mostly inaccessible; or, if accessible to large boats, only at high water. Between Cape St. Andrew and the Barren islands there is no shelter even for boats, as the river bars, with few exceptions, are impassable, even in fine weather. Along the whole length of the coast there is anchorage and good holding ground; but, in the offing, breakers and dangers are numerous.

Winds and Weather.—Less is known of local winds and weather on this part of the coast than elsewhere, but during the rainy season, and especially during the months of January and February, heavy squalls off-shore of the nature of West African tornadoes are very common.

Nosi Valavo (*Lat. 16° 37' S., Long. 44° 27' E.*).—This small island, in the delta of the River Sambao, is about 23 miles southward of Cape St. Andrew; the 3-fathoms bank extends north-west from the island for a distance of about 6 miles, continuing at that distance from the coast to the northward, but diminishing in width when southward of that bearing. Mount Ambohitrosi, bearing S.E. by E. $\frac{3}{4}$ E., leads to anchorage in 6½ fathoms, the entrance to the river bearing about E. by S. $\frac{1}{2}$ S., distant about 5 miles.

When passing 10 miles from the coast near this island, the cliffs of Ambatosarotra, commencing 5 miles southward of Nosi Valavo, several miles in length, and their southern end terminated by the valley of the River Marotondro, show out very distinctly; they are white, intersected by red patches.

The River Sambao is barred, and, at low water, some parts are dry whilst the sea breaks across the remainder. In the lower part, the river banks are lined with mangrove bushes, and swarm with mosquitos; above, there is an open well-wooded country. The boats of the *Flying Fish* entered by approaching the coast more than a mile to the southward and found less than 2 feet at low water; inside there were from 2 to 4 fathoms throughout the 5 or 6 miles her boats ascended; those of the *Thetis* found 6 fathoms close to the river bank about 10 miles above the entrance.

A village stands on a sandhill at the southern side of Nosi Valavo, on the port hand in entering the river; it consists of a few miserable huts, but was formerly a great trading place for slaves. Another

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 10° W.

similar village stands on the northern bank of the river about half a mile farther up. With these exceptions, the banks present one unbroken line of mangrove swamp for several miles, which, during the wet season, is impenetrable; but when the river is low, landing is easy, and many villages exist in the country behind.

The inhabitants are chiefly Sákalávas, and though at times disposed to be friendly, are untrustworthy, and, until French authority is established, boats wishing to communicate with them should be armed.

Coast.—Southward of Nosi Valavo and of the Ambatosarotra cliffs are the mouths of several small rivers—the Marotondro, in lat. 16° 47' S.; the Ampandrana in lat. 16° 51' S.; the Bemarivo, in lat. 16° 52' S.; and the Tsarapitsaha, in lat. 16° 58' S. Then follow the Betaria; the Onara, with several mouths; and the Ranobe, in lat. 17° 11' S., with the village of Beravina; within this space are the bays of Bemokotra, Mativoli, and Beravina. Maropopango bay is 5 miles south-westward of the last named; and the next, Kingala bay and village, are in lat. 17° 20' S.; Mialambo bay is about 4 miles farther south-westward, and nearly midway between Kingala and the northern entrance to Manambao river.

Chart 2461, Nosi Vao to Purdy sand.

River Manambao.—This river has at least three entrances, covering a frontage of 10 miles; the southern is named Manambao mati, and parts from the main stream about 23 miles inland; of the northern mouth nothing is known but that it appears to be barred and fronted by extensive banks. The central stream flows into the sea opposite Nosi Vao; on its right bank at the entrance, stands the important village of Tambohorano. There is good shelter for native vessels inside the bar. Vessels up to 6 feet draught may enter easily, but vessels of more than 40 tons should never attempt to enter because of the bar, which is very bad; the entrance is difficult to find, and there are no permanent marks.

The bank which borders the coast extends from 2 to 4 miles from it opposite the river entrances, and, at low water, the sea breaks near the outer edge in parts.

Anchorage.—The soundings in approaching the coast are regular, and good anchorage has been found in 5 fathoms, sand, with Nosi Vao bearing N. 60° W. distant 7 miles, though there appears to be as little as 4 and even 3½ fathoms outside of this position and in close proximity.

Supplies, &c.—Tambohorano was formerly one of the principal landing places for slaves from Mozambique; it still has considerable

General charts 597, 748a.

Chart 2461, Nosi Vao to Purdy sand. Var. 10° 20' W.

trade. Fresh beef can be procured at the village, and fresh water may be found on the sand-spit opposite. There is a weekly market here.

Kora Rythi (Koraraika) bay (*Lat. 17° 47' S., Long. 43° 55' E.*). — At 9½ miles southward of Tambohorano village is the creek and village of Bemoero; from this, southward, the coast receding forms Kora Rythi bay, so named from the village of Kora Rythi, or Manoleo, near the coast about its centre; the bay extends as far as Bepoaka (Kora Rythi) point, a distance of about 13 miles. This point is a steep cliff of moderate height and bright reddish colour, rendered remarkable by the uniformly flat ground in the vicinity, though a short distance to the southward, the land rises slightly and shows as two flat hills. Anchorage will be found northward of Bepoaka point, where fresh water may be procured. At 1½ miles southward of Bepoaka point is the mouth of the River Kanantri or Magomba, with the village of Mitampi on its south side. At one mile South of the mouth of the river, is a conical sand dune, 69 feet high, about half a mile from the coast.

New Maintirano is about 11 miles southward of Bepoaka point. The governor, officials, and principal inhabitants removed here from the low-lying village of Maintirano Mati. The settlement is built on high land about half a mile north-eastward of the village of Namela; there is a white flagstaff on the edge of the cliff.

The entrance to Namela river is about one mile north of the new settlement, but a narrow channel, New pass, has been made abreast of it.

Anchorage may be found, with good holding ground, in 3½ fathoms at 2 miles S. 82° W. from the flagstaff.

At 3 miles South, from New Maintirano, is Kinandrano pass; from which to Demoké pass in the south the whole low coastline as seen from the sea consists of long wooded islands lying in front of the real coast, between which islands are passes leading to intricate and narrow channels; these passes are barred and mostly too shallow for use, but both Kinandrano and Demoké passes are entered by surf-boats at high water.

MAINTIRANO MATI is about 6 miles southward of New Maintirano. It was formerly a great slave mart and a place of some importance, but now the trade is of very inconsiderable amount, and consists of imports of cotton goods and exports of cattle and rice. In 1910, 142 vessels entered the port, with a total tonnage of 23,426 tons. The South Andemba river, as it approaches the coast from the interior, expands into a large lagoon communicating with the sea by several

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Chart 2461, Nosi Vao to Purdy sand. Var. 10° 20' W.

passes. Maintirano pass, which is the central, is the only one of importance.

The old village is on the sandy island, about half a mile long, within the entrance, and its position may be known by a grove of large coconut trees at its southern end, the only one existing anywhere in the vicinity; northward of the village is a high sand dune, on which is the cemetery. Coasters lie aground on the shore of this island in perfect safety. Westward of the island, on the southern entrance point, is the Sakalava village of Sarodrano, which has a large coconut tree southward of it, and at 2½ miles north-east of the island is the village of Andemba, which has a flagstaff at its northern end.

Maintirano pass.—The bar may, in favourable weather, be safely crossed by ships' boats at or near high water; the best passage was found by the *Vesta*, in 1878, to lie northward of the breakers until close to the beach, where a narrow channel was marked by the smoothness of the water; but, from the liability to change, it is best to obtain the service of native canoes or boats, or at least of a native pilot before attempting an entrance.

Landmarks.—There is a very distinct gap in the range of hills at the back of Maintirano Mati, and a flat-topped hill to the southward, also a perpendicular cliff; the land to the northward is not so high nor so rugged in appearance. On a nearer approach, the masts of vessels in the river will generally be seen, and the village showing over the southern sandy entrance point, whilst the entrance itself will be seen about half a mile westward of Cemetery hill.

BANKS.—**North bank** is the outer of a series of banks that extend from the coast westward of New Maintirano; it lies 9 miles W. ¾ N. from the settlement, and is of coral, about one mile square, drying in parts 2 feet, and having, on its eastern edge, a sandbank awash at low water. There is good anchorage in 9 fathoms, sand and mud, about 5 cables north-eastward of the bank, well protected from heavy S.W. seas.

Middle bank (*Lat. 18° 3' S., Long. 41° 54' E.*) lies 1½ miles E.S.E. from North bank; it is about 7 cables long N.W. and S.E., and dries 3 feet; shoals extend 7 cables N.N.E. and S.E. from it.

Between North and Middle banks is a channel one mile wide, with depths of 8 and 9 fathoms in it, but midway between them is a coral head with 4 fathoms over it.

South-East bank lies 5½ miles W. by S. from New Maintirano; it is a coral bank extending 6 cables N.W. and S.E., and has 1½ fathoms over it.

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Chart 2461, Nosi Vao to Purdy sand. Var. 10° 30' W.

Santon bank is a small coral bank 3 miles southward of S.E. bank, having 6 feet over it. South pass is the channel between the last two banks.

Andolopanahi bank is the northernmost of the banks, and lies N.W. about 5 miles from New Maintirano; southward of it is W. Anakao bank, E. Anakao bank, and Namela bank, all of which are sandy and have depths of $1\frac{1}{2}$ to 3 fathoms over them.

From Namela bank shoal water extends towards Santon bank, leaving a channel about $1\frac{1}{2}$ miles wide, but there is a patch of gravel with $4\frac{1}{2}$ fathoms over it about the middle.

All these banks break in a heavy sea.

Approaches.—The best approach is from the South-east by the South pass through the Barren islands, *see* page 429. The South pass to New Maintirano may be taken by keeping the flagstaff on a bearing of N. 52° E. The approach by the coast from the northward is unsafe on account of the banks in that direction, just mentioned, and the channels between them being narrow and intricate; the water assumes a reddish grey colour over the shoal spots. The channel through the North pass of the Barren islands, *see* page 426, is fairly safe, and when inside the Bayfield sand, and the village distinctly seen, it should be steered for, bearing East, up to the anchorage described.

The vicinity of all the shoals in the offing, as shown on the chart, must be avoided, and it should be observed that only from Bepoaka point as far South as the Demoké pass has any systematic attempt been made at soundings near the coast. Northward and southward of those limits for many miles, shoal water, breakers, and treacherous ground are known to exist; therefore, any attempt to approach the coast in this vicinity should be made with the greatest caution.

Anchorage.—A good berth for large vessels is about $2\frac{1}{2}$ miles off-shore, in 5 or 6 fathoms, mud, with the cocoanut trees bearing about East, and the Wooded summit 8 miles to the southward bearing S.S.E.; small vessels may approach within one or 2 miles of the shore in 4 or 5 fathoms, on a similar bearing of the cocoanut trees. The depths appear to decrease slightly at the inner anchorage, probably owing to the silt from the river, but the soundings from seaward decrease very regularly to 3 or 4 fathoms, at one mile from the breakers on the bar. This anchorage is exposed to the full force of westerly winds, which sometimes cause a heavy sea, when it may be necessary either to anchor farther out or to proceed to the anchorages of Nosi Lava or Nosi Maroantali, *see* page 430.

Communication.—The Messageries branch line of steamers between Majunga and Durban call here outward bound; and also

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Chart 2461, Nosi Vao to Purdy sand. Var. 10° 20' W.

on their return. Maintirano is in telegraphic communication with Antananarivo, and thence with the world.

Tides and Tidal streams.—It is high water, full and change, at Maintirano, at 4h. 45m.; springs rise $16\frac{1}{4}$ feet, neaps $11\frac{1}{4}$ feet above the datum of the chart. At the anchorage, the ebb stream attains its greatest strength, six-tenths of a knot at half ebb, and sets S.W.; the flood stream, at two hours flood, and runs East about four-tenths of a knot.

Coast.—The village of Demoké (*Lat. 18° 12' S., Long. 44° 3' E.*) is on the northern side of the pass of that name, and an Arab settlement on the southern side. The next village is 5 miles to the southward, and about one mile southward of the Wooded summit before mentioned, which is shown on the chart. At 5 miles farther South is Ampandikoharana bay and village just opposite Nosi Maroantali, from which island the entrance is 6 miles distant. This bay is in fact the estuary of two rivers, the Kirore flowing into it from the N.E. and the Duko from the S.E., whilst the village stands on Chacao point, in the centre of the bay, between the two rivers.

Southward of this village, the coast trends about S. by E. for 18 miles to the entrance of the River Rivinza, or Manambolo as it is sometimes called, though that name is confusing, there being a much larger and more important river of the same name only 20 miles farther South. The intervening coastline is unimportant and almost unknown beyond the fact of its being low and wooded, with two creeks and rivulets, almost dry during the greater part of the year, with small villages near their mouths. They are Tondrolo, in about lat. 18° 32' S., and Namakia, 5 miles farther southward, and less than 3 miles northward of the Rivinza.

Chart 759a, Cape St. Andrew to Bevato island.

Sahoani, an unimportant creek and village, lies in a bight 5 miles south-eastward of the Rivinza river entrance. From thence the coast trends S.S.W. about 21 miles to the southern entrance of the River Manambolo. About midway, in lat. 18° 51' S., is Cape Kimbi, a somewhat prominent point showing as a dark mass with some remarkable white spots on it. At 6 miles north-westward from this cape is a shallow bank about 6 miles long in a N.E. and S.W. direction, and having depths of $1\frac{1}{4}$ to $4\frac{1}{2}$ fathoms over it, and at a distance of about $1\frac{1}{2}$ miles north-eastward from the northern extreme of the bank is a shoal with 2 fathoms over it.

The bay, village, and small River Ambondro are just southward of Cape Kimbi; just southward of them is Antamotamo village and river, and 3 miles farther South is the northern entrance to the Manambolo river.

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Chart 759a, Cape St. Andrew to Bevato island. Var. 10° 30' W.

River Manambolo, off the entrance of which shoal water extends some distance, may be recognised by three villages; it enters the sea by two mouths 4 or 5 miles apart; but Mafaidrano, the southern one, is impracticable even for boats. The Banjavili mouth, the northern and principal entrance, is available for small decked vessels. Nearly midway between the two mouths is the village of Banjavili (Behanjavilo), where a Government post has been established, at which the French flag may generally be seen flying; and a little southward of it, between it and the southern entrance of the river, is a remarkable clump of cocoanut trees.

ISLANDS and OUTER SHOALS.—The description now reverts to the islands and out-lying shoals fronting the long line of coast between Cape St. Andrew and the Manambolo river, the last of those dangers mentioned being the Kiakala reef at page 416. The next in succession to the southward, and also on or within the Pracel bank, is a shoal discovered by the *Flying Fish* in July, 1876. It was examined by the *Nièvre* in 1903, and was found to lie $13\frac{2}{10}$ miles N.N.E. from Nosi Vao; its extent is about 11 cables long N.W. by N. and S.E. by S. by 4 cables wide, and steep-to. The least depth found was 13 feet, but it is quite probable that there may be coral heads with less.

Discoloured water has been reported about 10 miles westward of Flying Fish shoal.

Philomel shoal, with a least depth of $2\frac{3}{4}$ fathoms over it, lies N. 35° W., a distance of about 2 miles from Vulla sand. The shoal is of small extent, and breakers are not visible until close to them.

Vulla sand lies 7 miles N.W. $\frac{3}{4}$ N. from Nosi Vao, from whence it can be seen at low water; it dries 4 feet.

Between the Vulla sand and Nosi Vao are three other detached reefs, having about them on all sides a very uneven bottom, the depth varying from 18 to 9 fathoms. Two of these reefs are nearly in line between the Vulla sand and Nosi Vao; the third, a dangerous reef, which only breaks occasionally, lies N.W. by W. $\frac{1}{4}$ W. distant 3 miles from Nosi Vao.

Chart 2461, Nosi Vao to Purdy sand.

Nosi Vao (Coffin island) (Lat. $17^\circ 29'$ S., Long. $43^\circ 45'$ E.) lies 10 miles from the Madagascar coast, and is not inhabited, but is the resort of fishermen from the mainland. It is low and of very dark colour, with a white sandy beach, and can be seen in clear weather at a distance of 10 miles; a slight rise near the centre grows a little brushwood; the greatest length, about half a mile, is from East to West, but it is surrounded by a reef, awash and steep-to, extending $1\frac{1}{4}$ miles westward, 8 cables south-westward, and about 4 cables from the island in other directions. Detached coral heads make it dangerous of approach on its north-western and south-western sides. The best

General charts 597, 748a.

Chart 2461, Nosi Vao to Purdy sand. Var. 10° 30' W.

landing place is on the eastern side, where the reef extends the least distance.

Breakers have been reported as having been seen about 5 miles south-westward of the island during low water, springs, and with a heavy swell on, but the few soundings taken have as yet failed to discover shoals in these directions.

Shoal water was also reported by the *Taunton Castle*, about $7\frac{1}{2}$ miles south-westward of the island, but its existence is doubtful.

In the vicinity of Nosi Vao during the rainy season, and especially during January and February, the heavy off-shore squalls known as tornadoes, so prevalent along the coast, are frequently felt, though their force is usually expended at a few miles from the shore; they are accompanied by much lightning and are very violent, but of short duration, and followed by torrents of rain.

The passage between Nosi Vao and the coast is safe on the island side, though the depth varies greatly; but towards the Madagascar coast, 5 or 6 fathoms only will be found outside the reef 4 or 5 miles in front of the River Manambao, and on the outer part the sea breaks in places at low water.

Shoal.—A bank about one mile in extent, and having a depth of 4 fathoms over it, lies about 9 miles northward of Flying Fish shoal.

Flying Fish shoal (South) (Lorho bank) (*Lat. 17° 58' S., Long. 43° 42' E.*).—This shoal was discovered by the *Flying Fish* in 1874; it is a bed of coral $1\frac{1}{2}$ miles in length N.W. and S.E. and 5 or 6 cables wide; the least depth is only 5 feet about the centre of the bank, with from 3 to 4 fathoms throughout the space of a mile, and from 18 to 22 fathoms, mud, round the reef.

Breakers were seen from the *Flying Fish* about the same time about 9 miles W.N.W. from the North bank. When seen, they bore E.S.E., distant $1\frac{1}{2}$ miles from the vessel, she being in 8 fathoms; from thence it deepened to 10 and 19 fathoms within one mile of the Flying Fish shoal.

Neither shoal nor breakers should be approached except in fine weather and by daylight, as they have not been closely examined.

Eastward and south-eastward of these shoals are the banks described at pages 421, 422, in fact, the whole space between these shoals and the coast should be carefully avoided.

Emile Heloise bank.—In 1883, the vessel *Emile Heloise* found a $3\frac{1}{4}$ -fathoms bank N.W. distant 12 miles from Nosi Mavoni.

In 1876, at 2 miles north-westward of the Emile Heloise bank, and before its discovery, the *Flying Fish* found 7 fathoms, hard bottom. One mile westward of that spot there was no bottom with 40 fathoms. The water gave no indication by change of colour of the sudden rise of bottom to 7 fathoms.

General charts 759a, 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 10° 40' W.

D'Estaing bank.—A bank with 9 fathoms was discovered by the *D'Estaing* about 17 miles westward of the Emile Heloise bank; although the sea was heavy, it did not break over this bank, which appears to rise from and to be surrounded by very deep water on all sides.

Chart 2461, Nosi Vao to Purdy sand.

Vaudreuil bank (Lat. 18° 11' S., Long. 43° 42' E.).—This bank, within the 10-fathoms line, covers an extent of 4 miles N.E. by E. and S.W. by W., but with a break in the middle. Towards each end are patches with 3½ and 3¼ fathoms respectively; the former bears from Nosi Mavoni N.N.W. westerly, and is distant 7½ miles, the latter N.W. by N., and is distant 7½ miles. The sea does not always break on any part of this bank; and, when on it, the water being clear, the bottom is visible from the masthead for a great distance.

In 1880, H.M.S. *Ruby* anchored near the southern part of this bank, and afterwards ran a line of soundings W.N.W. for a distance of 11 miles, which must have passed just northward of the Emile Heloise bank; she reported that the depths were very irregular throughout that distance.

Bayfield sand.—This extensive reef of rocks and sand lies about 6 miles N.E. by N. from Nosi Mavoni. It is 2½ miles long, and at its eastern end is a sandbank always uncovered, and which may be seen 5 or 6 miles distant, though it has no vegetation whatever. Towards the centre is another sandbank, which uncovers at low water only. The reef is fairly steep to all round, the least water being on its south-eastern side, where depths of 8 and 10 fathoms are found for some distance.

NORTH PASS.—Vessels from the northward or westward bound for Maintirano should pass between the breakers 5 miles southward of the Flying Fish shoal and North bank on the one hand, and the Emile Heloise and Vaudreuil banks and Bayfield sand on the other; bearing in mind that the latter is visible at 6 miles, but the Vaudreuil bank must be carefully looked for, as it does not always break. When the cocoanut trees of Maintirano Mati are seen they afford a good lead in if kept bearing about E. by S. ½ S.

Mpanjaka bank.—In 1889, the s.s. *Mpanjaka*, belonging to the Messageries Maritimes, discovered this reef, which consists of coral rocks in parallel lines running W. by S. and E. by N. and lying about 7½ miles W. by N. ½ N. from Nosi Mavoni; it has, so far as known, a least depth of 3¼ fathoms near its western end, and from that to 5 fathoms over an extent of 2 miles.

General charts 597, 748a.

Chart 2461, Nosi Vao to Purdy sand. Var. 10° 40' W.

Albatross rocks.—The centre of this reef, which is about one mile in diameter, lies $3\frac{1}{2}$ miles north-westward of Nosi Mavoni, nearly midway between it and Mpanjaka bank. French authorities doubt the existence of this bank, and it is possible that it may be identical with the Mpanjaka bank. They state that the assigned position of the rocks has been examined by a vessel passing completely round it at not more than a distance of 450 yards, and that no trace of them could be seen; they are, however, retained on the chart until further examination shall have thoroughly proved their non-existence.

Chart 759a, Cape St. Andrew to Bevato island.

BAJO DE VINES (*Lat. 18° 51' S., Long. 43° 1' E.*), the last of the distant dangers to be mentioned here, lies, according to its discoverer, the captain of the *Rosa del Juria*, about 51 miles W. by S. from Nosi Andrano of the Barren islands. When first seen, it bore W.S.W. distant $1\frac{1}{2}$ miles, and the vessel was in 41 fathoms, sand and shells. At 5 cables, there were $3\frac{3}{4}$ fathoms, coarse sand. At half a cable all round, there were $1\frac{3}{4}$ fathoms. A party landed on it and found the diameter to be about 14 yards; and that it dried about 2 feet at low water.

Chart 2461, Nosi Vao to Purdy sand.

BARREN ISLANDS.—These islands and shoals are at the southern end of the Pracel bank; the islands are seven in number, Nosi Mavoni and Maroantali being in the northern part; whilst Androtra, Dondosi, Andrano, Manghili, and Nosi Lava form the southern group. All are low, small, and sandy, but on a coral base. Some are wooded, others have only slight vegetation; their white sandy beaches render them conspicuous, and they may be seen 10 or 12 miles distant. Between and among the islands and banks are general depths of from 7 to 18 fathoms, but westward of them it deepens rapidly to ocean depths.

Nosi Mavoni (Smyth's island) is the northernmost of the group, the central part is about 21 feet above high water, and is covered with bushes but has no trees; it is at the north-eastern end of a reef nearly 2 miles long, but is itself not more than 300 or 400 yards in extent.

Amarella sand is $1\frac{1}{2}$ miles eastward of Nosi Mavoni; it is of coral, covered here and there with sand, and uncovers at its north-eastern part at half tide. Between it and Nosi Mavoni is another reef, separated from both by narrow channels.

Shoal.—A dangerous shoal, with only $1\frac{1}{2}$ fathoms over it, lies N. 70° E. at a distance of $6\frac{3}{10}$ miles from Nosi Mavoni.

General charts 597, 748a.

Chart 2461, Nosi Vao to Pürdy sand. Var. 11° W.

Nosi Maroantali (Flinders island) is $6\frac{1}{2}$ miles from the nearest coast of Madagascar, and $11\frac{1}{2}$ miles S.E. easterly from Nosi Mavoni; it is covered with rather fine trees. A reef extends all round it, but is narrowest on the eastern side. Good anchorage may be had in about 7 fathoms, mud, at one mile N.E. from its northern end.

Tides.—It is high water, full and change, at 5h. 0m.; springs rise 13 to 15 feet, neaps 8 to 10 feet.

Crescent reef lies 2 miles N.N.E. from Nosi Maroantali; it is $1\frac{1}{2}$ miles long North and South, and very steep-to, as is also Rontonina reef, formerly an island with trees on it, but now both it and Crescent reef are covered at high water, and nearly join at their northern ends, the Rontonina reef lying eastward of the Crescent reef. The bottom round these reefs and along the adjacent coast is chiefly mud, but the Lynx and many other reefs lie between them and Maintirano as described in connection with that port, the latest reported being one of 5 feet which breaks in a moderate swell; it lies about $3\frac{1}{2}$ miles westward of the Demoké pass; it is not safe to approach the coast within 7 miles in this locality.

Boursaint bank.—This bank was discovered in 1885 by the *Boursaint*. It lies about 6 miles north-westward of Nosi Androtra, and $7\frac{1}{2}$ miles S.S.W. $\frac{1}{4}$ W. from Nosi Mavoni. Its depth was reported as from $3\frac{1}{4}$ to $3\frac{3}{4}$ fathoms; a late but partial survey has failed to disclose anything less than $4\frac{1}{4}$ fathoms, but there is every reason to believe that shallower water may exist; therefore the former depths are retained on the charts.

Nosi Androtra (Beaufort island) (*Lat.* $18^{\circ}28'S$, *Long.* $43^{\circ}49'E$.) is about 14 miles off-shore; it is about 7 cables long N.E. by N. and S.W. by S., very narrow, 31 feet high at its northern end, and thickly wooded. At the highest part is a clump of casuarinas which has often been mistaken for a vessel under sail. It lies S. $\frac{1}{2}$ E. distant $10\frac{1}{2}$ miles from Nosi Mavoni, and W. by S. $\frac{1}{4}$ S. distant 8 miles from Nosi Maroantali. It stands on a coral reef which extends north-eastward 6 cables and south-westward $1\frac{1}{2}$ miles from the ends of the island. A coral bank extends nearly 2 miles eastward from the island, on which the least known depth is $4\frac{1}{2}$ fathoms.

Lockwood reef, on which the sea breaks heavily, is 2 miles south-westward of Nosi Androtra, and only 2 miles or less from the edge of the bank of soundings in that direction; it is separated from Nosi Androtra reef by a narrow 7-fathoms channel. A dangerous and unexplored coral flat extends about $2\frac{1}{2}$ miles in a S.S.E. direction from it.

General charts 759a, 597, 748a.

Chart 2461, Nosi Vao to Purdy sand. Var. 11° W.

SOUTH PASS.—This pass, through the Barren islands and shoals, leading to the anchorage off Maintirano, is the safest and best for vessels approaching that place from the southward. It lies between Nosi Androtra and the Boursaint bank, and is well marked by the breakers on Lockwood reef, and on the reefs of Nosi Androtra. The course through is about N.E., but caution is necessary to avoid the dangerous $1\frac{1}{2}$ -fathoms shoal S.E. of Bayfield sand; when the Maintirano cocoanut trees are seen they should be steered towards, as they make an excellent mark for the anchorage; *see* page 421.

There are other passages through these islands, but they are best avoided until better known.

Nosi Dondosi (Horsburgh island) is very small, covered with shrubs, but no trees, and lies at the north-eastern edge of a coral reef, nearly circular, and $1\frac{1}{4}$ miles in diameter. It lies S.S.E. $\frac{1}{2}$ E. distant 5 miles from Nosi Androtra, and there is a narrow but impracticable channel between it and the next islands eastward of it.

Nosi Andrano (Dalrymple island) and Nosi Manghili (Hewett island) are $1\frac{1}{2}$ miles eastward of Nosi Dondosi, and are on the same reef, which entirely surrounds both islands, is upwards of a mile wide, and extends nearly 2 miles in a south-westerly direction. The sand-bank connecting the two islands uncovers at low water. Nosi Andrano is wooded, and has a few huts on its north-western side. Nosi Manghili also has a few trees. There is a channel with not less than 7 fathoms between these islands with their reefs and Nosi Lava.

Nosi Lava (Heywood island) (*Lat. 18° 34' S., Long. 43° 56' E.*) is the southernmost of the whole group, and is 10 miles from the nearest part of the Madagascar coast. It is also the largest, though scarcely 6 cables in any direction; its northern part is rocky and covered with bushes, and there are a few huts on the north-western part. Its reef is narrow at the northern point, but in all other directions extends nearly one mile from the island.

Simpson sand is $2\frac{1}{2}$ miles eastward of Nosi Lava. It lies at the north-eastern edge of a nearly circular reef about 8 cables in diameter; it does not cover, and there is a good channel between it and Nosi Lava.

Between Simpson sand and the mainland there is a channel about 5 miles wide, but the depths are most irregular; there are three known shoals, with only $3\frac{1}{4}$ fathoms over them (for which *see* chart), and very probably many more.

Purdy sand or South bank lies S. by E. and is distant 8 miles from Nosi Lava; it is the southernmost known danger on the Pracel bank. It is a coral reef, less than a mile in extent, on the north-

General charts 759a, 597, 748a.

Chart 2461, Nosi Vao to Purdy sand. Var. 11° W.

eastern part of which is a sandbank which never covers; the sea breaks heavily on this reef.

N.W. $\frac{1}{2}$ W. a distance of $4\frac{8}{10}$ miles from Purdy sand is a shoal with $3\frac{1}{4}$ fathoms over it, and southward of the shoal for a distance of about $1\frac{1}{2}$ miles is a bank with 8 and 9 fathoms, where the bottom can be clearly seen.

Anchorage.—There are only two anchorages amongst these islands, where a certain amount of protection is afforded during bad weather. The first is that already mentioned between Crescent reef and Maroantali in 7 fathoms, mud, with the right extreme of the latter bearing about S.W. and the left extreme of Crescent reef N. by W. The second is northward of Nosi Lava in 7 fathoms, sand, with the East extreme of Nosi Lava bearing about S. by W. $\frac{1}{2}$ W. and 8 cables distant from its northern point, and the northern point of Nosi Andrano about N.W. by W. Landing is fairly good on these two islands. Either of these anchorages may be useful to vessels when the sea is too heavy and weather too bad to lie at anchor in the open roadstead of Maintirano.

Chart 759a, Cape St. Andrew to Bevato island.

Coast.—From the southern entrance to the Manambolo river, described at page 424, the coastline commences to fall back eastward, and between this and Belo, 100 miles to the southward, forms a bay receding about 21 miles, but with a considerable protrusion in its centre where the large River Tsiribihina flows into the sea. There are many other rivers within this space, but this and the Morondava are the two largest.

Caution.—Along all this coast southward of Maintirano, the water is more or less shallow with many known banks and reefs covered by but little water; and there are no doubt many others as yet unknown. The approach to a bank is often indicated by the presence of shoals of fish, which in their turn attract large flocks of sea birds.

Keli Mangioka, Belambo, and Maromoka are three small inlets all within 8 miles southward of the Manambolo river. Soahazo (*Lat. 19° 22' S., Long. 44° 27' E.*) is an inlet and village; here the French have established a military post, and the zinc roof of the principal building may be seen at a considerable distance, as also a lookout place a little to the northward and higher than the trees. There is good anchorage in 6 fathoms, mud, about West from this lookout. At 8 miles farther south-eastward is the village Maroalika, on the southern side of the entrance to the small River Parcelar.

RIVER TSIRIBIHINA or Sizibonji, of which the principal branch in the interior is called the Mania, reaches the sea by five

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 11° 20' W.

principal mouths; these, commencing from the northward, are the Rafinentana, Ambozaka, Soarana, Tsimanandrafozana, and the Namangoa branches. When approaching the delta from either North or South, a conspicuous cluster of cocoanut trees and a red-roofed house will be seen. These are noticeable marks on a coast which as a rule presents to the view only a long succession of dark and not very high mangroves.

The entrances to the five branches are obstructed by banks and bars on which the sea generally breaks; but they shift at different seasons, and too much reliance should not be placed on native guidance for entering.

The Tsimanandrafozana arm is the principal branch, and on it stands the large village of the same name, at which the Messageries steamers call. The mean breadth of the stream is about 330 yards, and it can be ascended for about 12 miles, to Serinam, with not less than 9 feet water by following the left bank. During spring tides, the stream is too strong for a boat to pull against, and at such times the water is of a reddish colour for 7 or 8 miles off-shore. The bar consists of a succession of banks extending North and South, their positions constantly changing, although a great volume of water is discharged, and, during the greater part of the year, a depth of 17 feet at high water exists in some channels; it is generally practicable during the fine season, but no stranger should attempt to enter without a pilot.

Beacon (*Lat. 19° 47' S., Long. 44° 26' E.*).—On an island immediately off or westward of the village stands a beacon of pyramid form 16 feet in height, the upper part painted black with a white band; the beacon is only visible from the anchorage.

On Prière islet, in the mouth of the river close to the beacon, are four large sheds standing some 60 feet above the sea level; they can be seen from the offing when about 10 miles distant.

It is impossible for a stranger to recognise the other mouths of the river, the whole coastline being fronted by a succession of low sandy islands through and among which the streams from the various mouths find their way to the sea.

Anchorage.—Vessels may anchor opposite the village, about 2 miles off-shore or one mile outside the line of breakers, in $3\frac{1}{2}$ or $4\frac{1}{2}$ fathoms; or farther out, in from 7 to 12 fathoms, good holding ground, with the clump of cocoanut trees bearing between E. by N. and E.N.E. The island in front of the entrance naturally divides the mouth into two channels, and communication is now said to be easier if a vessel anchors off the northern entrance channel, which she may do in $5\frac{1}{2}$ fathoms, with the middle hospital shed bearing about S.S.E. $\frac{3}{4}$ E.

The trade at Tsimanandrafozana is at present very small, and is

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 11° 30' W.

carried on almost entirely by Indians, who export the produce of the country to the German houses at Nosi Bé. The imports are cloth, cotton goods, glassware, iron household utensils, &c., of European manufacture.

OUTLYING SHOALS.—A bank, apparently about 3 miles wide and extending N. by W. about 5 miles from a position in lat. 19° 30' S., long. 43° 59' E., where 8 fathoms, sand and coral, were found, lies about 24 miles off-shore north-westward of Tsimanandrafozana. From the colour and state of the sea there appeared to be less than 8 fathoms over the northern part of the bank.

Another bank of some extent, with from 7 to 18 fathoms, has been reported about 10 miles S. by W. $\frac{1}{2}$ W. from the above bank.

D'Estaing shoal (Lat. 19° 54' S., Long. 44° 6' E.), with 2 $\frac{3}{4}$ fathoms over it, lies with Bosi bearing S.E. by E. $\frac{1}{4}$ E. distant 23 miles. At 3 miles westward of the D'Estaing shoal 25 fathoms were found, and then another bank with from 5 $\frac{1}{2}$ to 8 fathoms, discovered by the *Ruby*; at 2 or 3 miles westward of this latter appears to be the edge of deep-water soundings.

Ruby shoal, discovered in 1880 by the *Ruby*, has 5 fathoms over a small coral patch about 100 yards wide at 9 miles S.W. by W. $\frac{1}{2}$ W. from D'Estaing shoal; shoal water extends from the shallow spot about one mile south-westward, and 3 miles north-westward. About 3 miles south-eastward from it another shoal was found, about 3 cables long with 6 fathoms; it is shown on the chart as "position doubtful." Between those two shoals the depth was from 10 fathoms, coral, to more than 20 fathoms. Two other patches of 5 $\frac{1}{2}$ and 7 fathoms respectively, the latter 3 miles in extent E.S.E. and W.N.W., lie 2 or 3 miles north-eastward of the two shoals described, and breakers have been reported at a distance of about 5 miles southward of D'Estaing shoal. Evidently this is a vicinity where great watchfulness is requisite.

Cordelière bank, of 5 $\frac{1}{2}$ fathoms and possibly less, is surrounded by depths of 19 or 20 fathoms, lies 6 or 7 miles south-eastward of the cluster of shoals last described, and 14 miles N.N.W. $\frac{1}{4}$ W. from Morondava. Within the 10-fathoms line it is 1 $\frac{2}{10}$ miles long and 5 cables wide.

Boursaint bank.—This bank, not named on the chart, on which the sea was observed to break at long intervals, was discovered by the *Boursaint*; the bottom was distinctly seen, but nothing less than 8 fathoms obtained in a very cursory examination, though, from the sea breaking, there must be less and probably much less; it is shown on the French charts as

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 11° 30' W.

having less than 6 feet of water over it, and lies about 9 miles off-shore N.W. by W. from Morondava.

Ankaramai shoal was discovered in 1868 by M. Grandidier; it lies with Cape Akarara bearing S. $\frac{3}{4}$ E. and the entry to Tsianaloka S.E. by E. $\frac{1}{2}$ E. The general depth over it is $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, with some patches of coral with from 10 to 13 feet only. It extends nearly $4\frac{1}{2}$ cables East and West by $3\frac{1}{4}$ cables North and South.

Another shoal with a least known depth of $4\frac{1}{2}$ fathoms lies about 5 miles S.W. by S. from the Ankaramai shoal, and about the same distance north-westward of Cape Ankarana; this shoal has been recently searched for unsuccessfully.

Macé rock was seen in 1869 by M. Grandidier; from it the village of Morondava bears about E. by N., and is distant 8 miles. It is 5 cables in extent each way, and has several coral heads, with from 9 to 13 feet, and $5\frac{1}{2}$ fathoms around. French authorities now state that this shoal is $2\frac{1}{2}$ miles westward of its assigned position, which would place it very close to the Ankaramai shoal. Until further examination it retains its old position on the chart.

Coast.—Between the Rivers Tsiribihina and Morondava, a distance of about 32 miles S.W. by S., there are neither bays nor villages of importance. The first small village, Ankoro, is about 7 miles northward of Bosi.

Plan of Bosi on 1036.

Bosi is a village on a sandy spit which encloses a little creek, capable of giving shelter to small craft; the entrance, where the depth is only 3 feet, at low water, is round the sandy point and bank, about $5\frac{1}{2}$ cables northward of the village, but, at high water, the small craft using the place pass over the bank close to the point. Anchorage may be had at from one to $1\frac{1}{2}$ miles off-shore in from $3\frac{1}{2}$ to 5 fathoms, with Bosi village bearing about S.E. by E. The village is of very little importance except as a place where good canoes are built.

Chart 759a, Cape St. Andrew to Bevato island.

Between Bosi and Andranofotoski, shoal water extends some distance off-shore, and the French government reports the existence of a sandbank with less than 2 fathoms about 3 miles from the coast, and 8 miles south-westward of Bosi.

River Andranofotoski is an arm of the Morondava, and was, until about 1886, its principal entrance; it flows into a bay near Ambato village, about 10 miles south-westward of Bosi. The Kimoni opening, half-way between Andranofotoski and Morondava, and also two other small openings south-westward of the Kimoni creek, are all off-shoots of the main river.

Plan of Morondava on 1036.

RIVER MORONDAVA. — **Nosi Miandroka** (Lat. $20^{\circ} 18' S.$, Long. $44^{\circ} 17' E.$).—This large river flows through the
General charts 597, 748a.

Plan of Morondava on 1036. Var. 11° 30' W.

old province of Menabé, and the produce of the country is conveyed to Nosi Miandroka at its entrance by native river craft. The main stream, after passing Andakabé, some 10 miles inland, divides into many branches, traversing a fertile and populous plain in its various courses to the sea. The main flow now passes by Ambondro, Lovobé, and Miandroka, this latter being by far the most important branch, by which pirogues and other native craft ascend the river for 15 miles, the upper waters being navigated by canoes, which proceed many miles into the interior even in the dry season. The chief town, generally called Morondava, is on the island Nosi Miandroka, where are the residences and establishments of European merchants, and the stores of the Messageries Maritimes; it is the capital of the military district of Morondava, which district had, in 1909, a population of 90,333, of whom 190 were Europeans or assimilated and 289 Asiatics or Africans. Morondava town had a population of 650.

There is a military doctor at Morondava, and a native hospital at Andakabé.

The town of Morondava stands low, and is nearly surrounded by mangroves; it consists of two distinct groups of huts and houses, and is fast increasing; the eastern group has the Residence, a stone building with a red tile roof; in the western group is the old Hova custom-house flagstaff and also that of a British mercantile house. About 3 miles up the river is the Norwegian mission station of Bethel, which has a pointed bell tower, very conspicuous when approaching from the southward; southward of Ambondro is a small mission chapel, with a pointed steeple.

Ambondro (*Lat. 20° 18' S., Long. 44° 17' E.*), about one mile south-westward of the new town of Morondava, was formerly a commercial town, but is now almost deserted. About 1½ miles southward of it is the Lovobé arm, and on the southern point of its entrance is a flagstaff and a few huts. Between this and Ambondro, the coastline is low, wooded, and studded with huts.

Bar.—A long narrow sand bar running N.E. and S.W. fronts the river entrance. The south-eastern end is off the Ambondro entrance; the N.E. extreme is separated from the town of Morondava by a sandy islet, thus forming two channels to this entrance. The principal channel, between the islet and the bar, has smooth water at low tide; that between the islet and the land is accessible only at high water. The bar never dries entirely. At the lowest tides, it has about one foot of water for a width of 30 or 40 yards. Ships' boats can seldom enter except in the morning, and then only for about two hours before and after high water. In the afternoon the sea breeze causes a heavy sea, when landing can only be effected by canoes or by the native surf boats, which are excellent, and will cross the bar in safety in any weather, as will also the native schooners and small craft.

General charts 597, 748a.

Plan of Morondava on 1036. Var. 11° 30' W.

generally. Dhows loading in the river cross the bar and put to sea as late as half-ebb.

After passing the bar and turning southward between the bar and the islet, boats or small craft may, at high water, take up a berth for landing or unloading abreast of the old Hova custom-house, but otherwise they must land or run aground on the western side of the islet.

In approaching Morondava or Nosi Miandroka from the westward, it may be distinguished from the neighbouring coastal villages by being the only one with more than one flagstaff, though several have been removed. Just south-eastward of Ambondro is a group of coconut trees; their dark colour and height above all other trees in the neighbourhood render them very conspicuous and useful as a landmark. Behind and southward of that village is also a fringe of mangroves, well grown and terminating abruptly near the sea; they form a useful anchorage mark.

Ankasami shoal (*Lat. 20° 16' S., Long. 44° 15' E.*).—This shoal, supposed from a native report in 1875 to have only 2 feet over it, is charted as lying about N.W. by W. less than 3 miles from the coast at Morondava. It is marked E.D.; it has never been found by any British vessel, and French authorities do not even mention it.

Anchorage may be obtained with good holding ground in 7 fathoms, mud, with the French Residency flagstaff bearing about S.E., and the southern limit of Ambondro mangroves S. $\frac{1}{2}$ W. westerly. Vessels of light draught may anchor closer in on the same bearing of the flagstaff. Anchorage may also be found off the village of Lovobé (distinguished by the steeple of the mission station of Bethel); there is good holding ground, and the sea is smoother, while communication with the shore is easier.

Communication.—The Messageries branch line of steamers between Majunga and Durban call here every month, outward bound, and also on their return. Morondava is in telegraphic communication with Antananarivo.

Trade, &c.—Cattle rearing and rice growing are the principal industries of the province. The principal import is cotton goods, and exports, hides, rice, rubber, Cape beans, and mangrove bark. In 1910, the total imports amounted to £12,431, and exports £36,879; 881 vessels entered the port, of a total tonnage of 33,263 tons.

Tides and Tidal streams.—It is high water, full and change, at Nosi Miandroka at 4h. 36m.; springs rise 14 $\frac{1}{4}$ feet, neaps 10 $\frac{1}{4}$ feet. The direction and rate of the streams, which attain their maximum at half-tide, at springs, is:—Flood stream, E. by N. seven-tenths of a knot; ebb stream, West, half a knot. At neaps, the streams are very weak and variable, but the flood has a northern and the ebb a southern tendency.

Plan of Morondava on 1036. Var. 11° 40' W.

Supplies, &c.—Cattle, rice, many kinds of fruit, vegetables, and fish are plentiful; water, good enough generally, is got from pits in the sand and from the river.

Chart 759a, Cape St. Andrew to Beavato island.

COAST.—Morondava to Belo.—About half-way between Morondava and Cape Ankarana is the mouth of the River Taolampia; here the downs terminate with a low but well-defined hill having a white mark on it, and a tuft of small trees on its summit. A few miles farther southward, but northward of Cape Ankarana, is the wide delta of the River Manarivo.

Cape Ankarana (*Lat. 20° 30' S., Long. 44° 8' E.*), about 15 miles south-westward of Morondava, is rendered conspicuous by the white sand mounds of which it is formed, and by the upper part being covered with bushes; the cape is surrounded by a fringe of reefs. Andriambé point, just south-westward of Cape Ankarana and forming with it a sort of double cape, consists of brown ground, terminating in a perpendicular cliff; the extreme point, black and rocky, is almost detached from the land behind, and in some directions looks like an island. Andriambé is also crowned by a clump of small trees.

Anchorage for small vessels, in case of need, may be found in a little bay on the north-eastern side of Cape Ankarana. Water may be obtained from the River Manarivo, and there are villages in the neighbourhood.

With the exception of the double point just described, the coastline between Morondava and Belo presents to the view a sandy beach, backed by a line of trees. Southward of Cape Ankarana the coast recedes slightly, forming a wide bay, into which many unimportant creeks and streams discharge. Between Ambararata village and Belo, a sandbank lies parallel with the coast at a distance of 330 yards, leaving a boat passage between it and the shore; the whole line of coast between Morondava and Belo may be passed with safety at a distance of 2 miles.

RIVER BELO is nothing but a large estuary extending into the interior, and navigable only for a short distance; it is enclosed by a sandy spit and bars, and by an island about $5\frac{1}{2}$ cables in diameter. Between the sand-bars are many passages available for boats, but only one deep enough for small vessels. The village stands on a long, narrow, sandy point, at the end of which is the old Hova custom-house and flagstaff. In the middle of the village is a large one-storied building with a zinc roof; it is a Norwegian mission establishment and is conspicuous. About $7\frac{1}{2}$ cables S.W. by S. from the Hova flagstaff is a large casuarina tree, which is the best mark for making the place, as it is seen long before the flagstaff. The space within is land-locked, and is divided by sand islands into separate basins, where

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 12° W.

coasting vessels and other small craft may anchor; in one of them there is a depth of from 4 to $5\frac{1}{2}$ fathoms, and sufficient space for vessels of from 300 to 400 tons; the depth on the bar is about 3 feet at low water.

The principal entrance is between a sandbank very steep-to, projecting one mile to seaward off Belo, and another to the eastward, which uncovers 11 feet, at springs. The banks are, however, very liable to change.

This place is frequented by vessels from Natal, which take cargoes of bullocks, and by a few small craft carrying on a coasting trade.

Sponges and good mother-of-pearl and pearl oysters are found here, and schooners are built.

Anchorage (*Lat. 20° 42' S., Long. 44° 0' E.*).—About 2 miles north-eastward of Belo village and three-quarters of a mile south-westward of Ambararata village is a group of casuarina trees. The best anchorage is off the village and northward of the bar in about 7 fathoms, sand and mud, with the remarkable single casuarina tree bearing S. $\frac{1}{2}$ E. easterly, and Ambararata group of casuarinas S.E. by E. Here a vessel will be $1\frac{1}{2}$ miles from the village, and boats can cross the sandbank at high water. Small vessels under a good native pilot may cross the bar, over which there are 15 feet at high water, springs, and enter the harbour, which is a large open basin with more water than on the bar.

Tides and Tidal streams.—It is high water, full and change, at Belo at 5h. 37m.; springs rise 14 feet, neaps $9\frac{3}{4}$ feet. The flood stream attains its maximum rate at one hour before high water, and runs E. by N. eight-tenths of a knot; the ebb, at half-tide, and runs only a quarter of a knot.

Caution.—Care should be observed in approaching Belo as the ground has not been closely examined, and many undiscovered dangers may exist. The lead and a good lookout from aloft are the best guides. It should be borne in mind also, as previously remarked, that whereas banks and shoals in this vicinity rarely cause discoloration of the water, the discharge from rivers frequently does so where no shoals exist.

Coast.—From Belo, the coast extends south-westward about 12 miles to the entrance of the River Lampaolona. In the middle of that space is the village and estuary of Antanga, and the cliffs of the same name facing the sea for 3 or 4 miles, as far as the Lampaolona, which river is a mere watercourse generally dry near the sea. Mit-china bay is a slight indentation just northward of the river. From this river, the coast trends about S.S.W. for a distance of 16 miles as far as the village Ankoba, where the land again becomes high and wooded; between the two places named, the River Maintapaka falls

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 12° W.

into the sea. Southward of Ankoba, off which there is anchorage in from $3\frac{1}{4}$ to 4 fathoms at $1\frac{1}{2}$ miles off-shore, the coastline begins to bend round westward, and in the course of about 22 miles completes the curve known as Ampasilava bay, and presently described.

DETACHED SHOALS AND ISLETS.—Fronting the whole coastline just described are numerous dangers, some lying as much as 12 miles off-shore, but most of them between 5 and 10 miles, and many so close to the shore and so little known, especially in the neighbourhood of the Antanga cliffs, or roughly, between the Osprey and Boursaint shoals, as to render any attempt at an in-shore passage exceedingly dangerous. The following are the principal known shoals, and it is probable that many others remain to be discovered.

Sandy knoll about 9 miles N.W. $\frac{1}{2}$ W. from Belo, is the outer shoal at this part, and would appear to be only about 2 miles within the edge of deep-water soundings. It is a large coral reef upwards of 3 miles long, N.E. by N. and S.W. by S., on which the sea breaks heavily; it has two sandbanks, one at either end, uncovering at low water, that at the north-eastern end being the highest.

Bawden shoal (*Lat. 20° 41' S., Long. 43° 54' E.*), about 7 miles north-westward of Belo, was originally examined by Nav. Lieut. Bawden of the *Osprey* in 1883; a further examination by French authorities shows the least depth at low water on a patch at the north-eastern end to be only 7 feet; from this spot the shoal extends in a south-westerly direction nearly 3 miles with increased depths. From the shoal spot, the coral reef last described bears N.W. $\frac{1}{4}$ W., and is distant about $2\frac{1}{2}$ miles.

About $1\frac{1}{2}$ miles S.S.E. from this spot is a small $5\frac{1}{2}$ -fathoms bank, and S.S.W., distant $2\frac{1}{2}$ miles, is another with 5 fathoms. Nearly midway between Bawden shoal and Sandy knoll is a 4-fathoms patch, but the general depth between these reefs is 8 or 10 fathoms. The passage between these shoals and the coast may be considered safe.

Nosi Andriangori (Barlow island) is $3\frac{3}{4}$ cables long N.W. and S.E. by $2\frac{3}{4}$ cables wide, low, and covered with a stunted vegetation, amongst which are a few casuarina trees; it lies about $7\frac{1}{2}$ miles from the coast opposite Antanga cliffs. A reef surrounds the island, extending 6 cables in a north-westerly direction, but not more than 120 yards in any other; the reef is steep-to, 5 fathoms being found close to the edge all round. About one mile northward of the island reef is a 5-fathoms patch. The island and patch are close to the edge of the bank of soundings, immediately westward of them there being no bottom with 100 fathoms.

Sand island reef is about $4\frac{1}{2}$ miles N.E. by E. from Nosi Andriangori. The sandbank at its eastern extreme uncovers about 3 feet,

General charts 597, 748a.

Chart 759a, Cape St. Andrew to Bevato island. Var. 12° W.

and is steep to all round, except towards the S.W., where 2 fathoms is found at a distance of one mile.

Osprey shoal was discovered by the *Osprey* in 1883; it is about 10 miles south-westward of Belo, and 3 miles off-shore abreast of the north-eastern end of Antanga cliffs; $1\frac{1}{2}$ fathoms is the least water found over it, and 5 fathoms at 2 cables to the northward, deepening quickly to 10 fathoms; but this shoal can only be considered as one out of many shoal heads existing on the large bank extending from the coast in this neighbourhood, as already mentioned, rendering any approach to the coast between this and the Boursaint shoal, 8 miles farther south-westward, very unsafe.

Boursaint shoal (Lat. $20^{\circ} 56'$ S., Long. $43^{\circ} 51'$ E.) is about 2 miles off-shore, abreast of the southern point of entrance to Lampao-lona river, and may be assumed to be connected with the coast. On its eastern side are three heads with less than 6 feet, that to the N.E. having only one foot at low water, springs. From this head, Nosi Andriangori bears N. by W. $\frac{1}{2}$ W., distant $7\frac{1}{2}$ miles. It does not show by discoloration, and is steep to on its western side.

A reef, called Nosi Bé, which uncovers in its eastern part at low water, lies $4\frac{1}{2}$ miles S.S.W. of Nosi Andriangori.

In 1883, the *Vaudreuil* found a 5-fathoms bank, $2\frac{1}{2}$ miles S.W. by W. $\frac{1}{2}$ W. from the southern part of Nosi Andriangori; the bottom was seen distinctly on both sides of the vessel.

A reef about one mile wide lies N.E. $\frac{1}{2}$ E. distant $4\frac{3}{4}$ miles from Nosi Andrianmitarika, and 7 miles N.W. $\frac{1}{2}$ W. from the entrance of the Maintapaka river; about 4 miles farther out in this latter direction is a $4\frac{3}{4}$ -fathoms patch.

Chart 2464, Nosi Andrianmitarika to Mananonoka point.

Nosi Andrianmitarika (Crab island) lies S.S.W. $\frac{1}{2}$ W. distant 17 miles from Nosi Andriangori, and 8 miles from the coast; it is about 800 yards long North and South, by 400 yards wide at its southern end, and about 16 feet high. As seen from East or West there are two distinct clumps of casuarina trees on it, the northern clump being the larger of the two; also a few tamarind trees, of which the largest, being of pyramidal form, has been mistaken for a rock. A fringing coral reef encircles the island, extending from it 5 or 6 cables on the northern and western sides, and $1\frac{3}{4}$ miles to the southward.

This island is one of the best points to make when desiring to close with Ampasilava bay. Anchorage in 9 fathoms, mud, may be found 7 or 8 cables from the eastern side of the island, well sheltered by the reefs extending northward and southward of it.

Tides and Tidal streams.—It is high water, full and change, at Nosi Andrianmitarika at 5h. 40m.; springs rise 14 feet, neaps

General charts 597, 748a.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 12° 20' W. 12½ feet. The flood stream runs at the rate of half a knot south-eastward; the ebb, at the same rate, westward.

AMPASILAVA BAY is about 20 miles wide between the mouth of the River Maintapaka, its eastern boundary, and the extreme northern point of the islands and shoals forming the delta of the River Mangoka, its western boundary; from this line, it falls back about 7 miles to its head, where stands the village of Ampasilava, or Andranopasi (*Lat. 21° 18' S., Long. 43° 45' E.*). Eastward of the village, for 1½ miles, the land is low and thickly wooded; here is the mouth of a small river, and from it eastward are a succession of moderately high downs tufted with groves of small trees, with the exception of one hill about 6 miles N.E. by E. from the flagstaff, which, being quite bare of vegetation, is conspicuous. The whole shore of the bay is bordered by a white sandy beach, from which extends a fringing coral reef.

The village is palisaded, and at its north-eastern extreme is a French factory and flagstaff. Here was formerly the Hova settlement, and its flagstaff is now the French official flagstaff. The Sakalava villages are farther in the interior. These, together with a large tamarind tree, will be noticed in approaching the anchorage. A mile westward of the village is another but much larger river; it is the easternmost of the numerous branches of the Mangoka, the delta of which river commences here.

Several sandbanks lie off the village; one extends 2 miles to seaward from the mouth of the river eastward of the village, and does not uncover; another lies 5 cables westward of this and covers only at springs. Between these is a boat passage to the landing, with only one foot over its bar at low water. At the western extreme of the western bank is West islet, on which are two trees close together. East islet has a few huts on it, and is nearer the coast.

This coast is inhabited principally by natives who are excellent seamen, and man the coasting craft.

Anchorage.—The holding ground is good throughout the bay, but the anchorage is a long way off-shore. A vessel should run in with the Government flagstaff bearing S. ¾ E. until the two trees on West islet bear S.W. ¼ W., and then anchor in 5 fathoms, mud, having first passed over depths of 4½ fathoms 5 cables to seaward of the anchorage. Vessels of light draught can stand closer in, by the lead, on the same bearing of the flagstaff, which bearing also leads through the boat passage to the landing place at the village. The least water in the anchorage ground is 3½ fathoms.

In strong westerly winds, it is well to anchor farther out; or, better still, to proceed to the anchorage under shelter of Nosi Andrianmitarika.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 12° 20' W.

Climate.—At this anchorage, in January, the rainy season, the *Flying Fish* found the sea breeze set in from N.W. about noon, veering to West by sunset, to South after midnight, and decreasing to calm by 4h. a.m. From sunrise until noon the heat was very oppressive, but during the remainder of the day the breeze made it more tolerable.

Tides and Tidal streams.—It is high water, full and change, in Ampasilava bay at 5h. 0m.; springs rise $14\frac{1}{2}$ feet, neaps $9\frac{3}{4}$ feet. The flood stream sets about E. by S. eight-tenths of a knot, the ebb stream N.N.W. half a knot. During the ebb tide, the muddy water from the river frequently extends several miles from the coast, looking like a bank.

Supplies of any kind are scarce, and obtained with difficulty, and there is little or no trade.

RIVER MANGOKA.—This river discharges by three principal branches and many smaller ones, covering an extent of coastline some 40 miles in length. This delta, with its sandbanks, changes with the seasons, and the banks extend as a rule fully 2 miles outside the visible mouths of the rivers. The coast is flat and monotonous, and, wherever at all permanent, is bordered and occupied by mangroves. The bar sands dry in many places, and the channels are shallow, sinuous, difficult, and not to be safely attempted by a stranger. Nevertheless some entrances are used by boats, pirogues, and small craft up to 80 tons, which latter have to ground in a favourable position at high water. A French steam launch under native pilotage ascended the main branch for 17 miles, as far as the village of Ankazohabo, and everywhere found more than 7 feet water. The river is navigable with canoes for about 143 miles, but only from May to September.

Landmark.—At 8 miles westward of Ampasilava is the village of Marohata; about 6 miles south-westward of it, and 13 miles from Ampasilava village, is Ambohibé village (*Lat. 21° 20' S., Long. 43° 31' E.*), close to one of the outlets of the Mangoka river. It is an important commercial place, and the coastal steamer between Majunga and Durban calls here both ways. Near it is a Norwegian mission station and chapel, of which the zinc roof, showing over the green mangrove trees, forms a good mark for this part of the coast.

The land in this neighbourhood is everywhere low, sandy, and covered with trees, and here the coastline turns gradually to a southerly direction, intersected by the numerous branches of the River Mangoka, until the Kitombo branch is reached, on which stands the village of that name. The three passes which give access to the river are: At the N.E., the Pass of Ankontakonta, lying N.W. by N. and S.E. by S. with a depth of $2\frac{1}{2}$ feet; on the West, the Pass of Tamboulava, lying in the same direction, but with a foot less water; and the third, also on the West, lying close to the shore, and fit only for pirogues.

General charts 759a, 597, 748a.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 12° 40' W.

Breakers.—Off Kitombo a bank extends for a distance of about 11 miles from the coast, and gradually decreases in width until northward of Ambohibé, where its extent is about 2 miles from the coast. The least known depth is $5\frac{1}{2}$ fathoms $6\frac{1}{2}$ miles westward of Ambohibé, but the bottom being rocky there may be many shoal spots, and the Messageries Maritimes s.s. *Persepolis* reports having observed heavy breakers in approximately lat. $21^{\circ} 26'$ S., long. $43^{\circ} 16'$ E., and also in lat. $21^{\circ} 28'$ S., long. $43^{\circ} 16'$ E. Discoloured water has also been reported about 20 miles westward of Ambohibé.

Coast.—Continuing southward, the coast inclines slightly eastward, and then bends gradually round westward, forming Andefitra point, which point, with its extensive reefs, shelters Antsira bay, northward of it, from south-westerly winds; the inner part of this bay is bordered by mangrove trees, and in its south-eastern corner is the entrance to the River Antseranamahefitra, said to be another branch of the Mangoka.

At $2\frac{1}{2}$ miles south-westward of Andefitra point is a coral point, and then Cape Morombé, which is bordered by a sand and coral reef very steep-to. The cape rises with a steep slope of sand 13 feet high; when seen from a little distance and assisted by mirage, it has sometimes been mistaken for a cliff. A short distance inland is a ridge of hills about 230 feet high gradually sloping down to the cape, near which the land is low and wooded. Here stands Morombé village, where, however, no supplies are obtainable.

TSINGILOFILO BAY, so called, is included between Andefitra point and Cape Tsingilofilo, the northern extreme of Bevato island, which two extremes are 15 miles apart, but as its centre at Cape Morombé protrudes westward of the line of the extreme points, there is in reality no bay. Opposite or fronting the whole of its coastline is a series of reefs and islets as presently described, and the coast southward of Cape Morombé is covered with mangroves, indicating the estuary of what at certain seasons must be a considerable river.

Nosi Bevato (Lat. $21^{\circ} 55'$ S., Long. $43^{\circ} 17'$ E.).—This island was formerly believed to be a peninsula; it lies, however, in a bight of the mainland, of which the south-western boundary is Itseré point, is 7 miles long N.N.E. and S.S.W. by less than half that width, and is separated from the mainland by a narrow, shallow, and rocky arm of the sea ending northward in Tsingilofilo bay. This arm of the sea is named Befotaka bay.

ISLANDS AND SHOALS.—From Andefitra point to the North point of Nosi Bevato, and between 3 and 4 miles from the coast, is the line of shoals and islets already mentioned, leaving between

General charts 759a, 597, 748a.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. $12^{\circ}50'W$. them and the shore of Tsingilofilo bay a passage from one to $1\frac{1}{2}$ miles wide, with depths of from $2\frac{3}{4}$ to 6 fathoms. Between these banks are narrow passages by which vessels may enter the inner channel direct from the offing.

Nosi Andramona, the northernmost of these islets, is 3 miles W. by N. $\frac{1}{2}$ N. from Andefitra point. It is nearly round, 27 feet high in its south-eastern part, and covered with trees; it is surrounded by reefs and connected with the point by a bank of sand, rock, and coral, over which there is not even a passage for boats except at high water. South-westward from the island, shoal water, over a coral bottom, extends for one mile.

Nosindolo (*Lat. $21^{\circ}42' S$, Long. $45^{\circ}20' E$.*) is a group consisting of two small rocky islets, 6 feet high, and a sandbank, which covers only at high water, springs. They lie south-westward of Nosi Andramona, separated from its shoals by a passage 7 cables wide, with central depths of from $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, and 4 fathoms close to the steep sides of the shoals. At $3\frac{1}{2}$ cables S.S.E. $\frac{1}{2}$ E. from these islets is a sandbank, dry at low water but covering at high water of all tides, and, when covered, nearly always marked by breakers.

Nosi Bé is a reef bearing S.S.W. from Nosindolo, and separated from it by a channel about 2 cables wide with $3\frac{1}{2}$ fathoms water; it is nearly square, and about $1\frac{1}{2}$ miles in extent. At its south-western edge is a rock which uncovers 7 feet at low water, and near its northern extreme is one rock which dries 11 feet. With these exceptions, the whole reef covers at half tide.

Cape Tsingilofilo reef.—A large reef extends 9 miles northward from this cape, on which are many islets and rocks above water; of these Nosi Trozona, the northernmost, is 3 miles from the mainland, and bears N.W. by W. from Cape Morombé; it is of diamond shape, and each side about half a mile in length. Near the centre, it rises to a height of 43 feet, and has a few trees. Reef, covering at half tide, extends some distance northward and westward of it, and to the south-eastward a bank of sand extends fully one mile, uncovering at low water, springs, at its extreme end.

About one mile southward of Nosi Trozona, and on the Cape reef, is the round islet Timpoi, about 100 yards in diameter, of some little height, and with a few trees. Nosi Ratafani is 5 miles southward of Nosi Trozona, and on the same line of reefs; it is 59 feet high, long, narrow, rocky, and wooded. South-eastward of it is Ratafani islet, of conical form, 125 feet high, and with trees on it. From the offing it shows above the main island, and might be mistaken for its summit. Half-way between Timpoi and Nosi Ratafani is a large rock, which

General charts 759a, 597, 748a.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 12° 50' W. serves to mark the inner edge of these reefs, which have an average width of a mile on the inner side of the islands from Nosi Trozona to the northern point of Bevato.

Directions.—Three channels lead into Tsingilofilo bay, viz.:—the first, and most northern, between Nosi Andramona and Nosiudolo; the second, between Nosindolo and Nosi Bé; and the third, between Nosi Bé and Nosi Trozona. The second and third being narrow and intricate should not be taken by any vessel without good local knowledge. The first is the best and a safe passage, and a vessel has only to pass between the surrounding reefs of Nosi Andramona and Nosindolo, and then steer for Cape Morombé, bearing S. by W. $\frac{3}{4}$ W. for an anchorage.

Anchorage.—There are two anchorages in the bay, known as the Village, and the Cape anchorages. The first is about 7 or 8 cables north-westward of Morombé village, with the North point of Nosi Trozona bearing W. by N. $\frac{1}{2}$ N., and Cape Morombé S.S.W., in $4\frac{3}{4}$ fathoms, mud, well protected and good holding ground, but the space very confined. The second is the best, and is southward of a line joining Nosi Trozona and Cape Morombé, the bottom as before.

Tides and tidal streams.—It is high water, full and change, in Tsingilofilo bay, at 6h.; springs rise $12\frac{1}{2}$ feet, neaps $8\frac{1}{2}$ feet. The streams in the principal channel turn at high and low water; but in parts of the bay, owing to natural obstructions and channels ending in culs-des-ac, the flood runs twice as long as the ebb.

Morrison reef (*Lat. 21° 49' S., Long. 43° 12' E.*).—About W. by N. $\frac{1}{2}$ N. from the northern extreme of Ratafani islet, and $2\frac{1}{2}$ miles from the outer breakers, is this bed of rocks which partially uncovers at low tide; it is about 8 cables in extent and shows breakers directly the sea is a little rough; a spit with 6 fathoms near its extreme extends S.S.W. for a distance of one mile.

At $2\frac{1}{2}$ miles northward of Morrison reef is a shoal with only 3 feet over it at low water; between these shoals and the breakers on Cape Tsingilofilo reef there are from 13 to 15 fathoms, and at 3 cables to the westward there are from 18 to 20 fathoms, with no bottom at 40 or 50 fathoms just beyond. It is necessary to guard carefully against these two dangers, for there are periods during fine weather when the sea does not break on either, and at high water it is only when there is a little swell on that the sea breaks on the latter at all; during a strong sea breeze there are always breakers. Vessels may pass between these dangers and the Tsingilofilo reef, which always breaks.

Rogier reef.—Opposite Nosi Bevato, and at $1\frac{1}{2}$ miles N.N.W. $\frac{1}{2}$ W. from Itseré point, commences this reef, which runs

General charts 759a, 760, 597, 748a.

ITSERÉ POINT.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 13° W. parallel with the island and terminates opposite its northern point; it is about 5 miles long and variable in width, being narrow about the middle and spreading out at each end. It is about 2 miles distant from the coast, which is fringed by reefs one mile or more in width, leaving a navigable passage between them and the Rogier reef, with from 3 to 5 fathoms. Vessels bound northward from the anchorage of Nosi Andrahombava will find a good passage between that island and the southern end of Rogier reef, with from 12 to 14 fathoms.

Itseré point.—At $2\frac{3}{4}$ miles southward of Cape Tsingilofilo is Cape Bevato, the western point of Bevato island, where are two rocks, of which one is 61 feet in height. At 3 miles southward of Cape Bevato is Itseré point; it may be recognised by two rocky islets close off it, and especially by an isolated pointed hillock, 39 feet high, nearly one mile southward of which is another equally noticeable hillock, the two hillocks forming an excellent landmark. From thence southward, the coastline offers no remarkable object; but about 2 miles southward of the cape, which is surrounded by a fringing reef, is a detached reef, 2 miles long, with many rocks and islets scattered over its surface, of which the two largest are Nosi Bemoka at the northern and Andamotibé at the southern end; both of these are easily recognised.

Abreast and southward of Itseré point, at about 3 miles from the coast, are the following islands and reefs:—

Nosi Andrahombava. (Grave island) (*Lat. $21^{\circ} 58' S.$, Long. $43^{\circ} 11' E.$*), abreast of Itseré point, has a few straggling casuarinas, whilst other islands near have only low bushes on them. It is about two-thirds of a mile long N.N.E. and S.S.W., 22 feet high, uninhabited, and surrounded by reefs which extend nearly $1\frac{1}{2}$ miles south-south-westward, half a mile westward and northward off the north-eastern point, the island is nearly steep-to; along the eastern side the reef extends but a short distance. Here vessels may anchor and be moderately well protected.

Parsons reef lies about $2\frac{1}{2}$ miles southward of Nosi Andrahombava; it is $7\frac{1}{2}$ cables wide, and on its eastern side a sandbank uncovers at low water. The passage which separates it from Nosi Andrahombava reef is about a mile wide, with general depths of 9 fathoms, but it cannot be considered safe, as many patches of coral, with only 28 feet, have been found in it, and there may be others with less.

Nosi Fasi is about one mile N.N.E. of Nosi Hao and 3 miles southward of Parsons reef, from which it is separated by a passage with apparently from 8 to 12 fathoms. On its eastern edge is a sandbank which uncovers at half tide, and on its southern side is a

General charts 760, 597, 748a.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 13° W. passage nearly 4 cables wide between it and Nosi Hao, but there is known to be a $3\frac{1}{2}$ -fathoms shoal in this passage, and as it has not been thoroughly examined, it also cannot be considered safe.

Nosi Hao, or Murder island,* is 8 miles south-westward of Itseré point, about one mile long N.N.E. and S.S.W. by 2 cables wide, covered with brushwood but with no trees, and is only about 13 feet above high water. It is surrounded by reefs, which extend about 2 miles southward and one mile westward from it, but only about one cable from the northern point and eastern side. In 1881, it was stated by French traders that 40 or 50 cannon and 2 anchors, overgrown with coral, could be seen on these reefs. Off the north-eastern point of the island, where the reef is narrowest, the swell from the southward and that coming from seaward meet, causing a smooth and affording a good place for safe and easy landing.

Anchorage (*Lat. 22° 6' S., Long. 43° 11' E.*).—Vessels may anchor one mile off the eastern side opposite the centre or northern end, in about 9 fathoms, where the holding ground is good, but strong southerly winds bring in a heavy sea, when the anchorage at Nosi Andrahombava is to be preferred.

Tides and Tidal streams.—It is high water, full and change, at the anchorage of Nosi Hao, at 5h.; springs rise $8\frac{1}{4}$ feet, neaps $5\frac{1}{2}$ feet. The flood stream sets N. by W. about a quarter of a knot, the ebb in the opposite direction about half a knot.

Directions.—When approaching the anchorage of Nosi Hao or that vicinity from the offing in clear weather, a large opening with perpendicular sides will be seen dividing a range of mountains in the interior; a course should be steered towards that opening until the islands are recognised, which it is not always easy to do with the higher land of the coast immediately behind them. When once seen, however, the high trees on Nosi Andrahombava should prevent that island being mistaken for Nosi Hao, on which there is only low scrub.

Vessels may approach the anchorage inside Nosi Hao by four different passages; that most frequently taken when coming from the southward is between Nosi Hao reef and the coast reef, both of which are steep-to and always break, the narrowest part of the passage being $1\frac{1}{2}$ miles wide. The second passage is between the northern end of Nosi Hao and the reefs of Nosi Fasi, and the third is northward of the latter reef; neither of these two are recommended, as already stated. The fourth passage is that by which the anchorage at Andrahombava is approached: vessels having entered that anchorage may with perfect

* So named because in 1824 when H.M.S. *Barracouta* was employed in surveying, two midshipmen were assassinated on Hao island and buried on Nosi Andrahombava.

Chart 2464, Nosi Andrianmitarika to Mananonoka point. Var. 13° W. safety run on to the southward for Nosi Hao anchorage, merely preserving about a mid-channel course between the inner and outer reefs.

Mpanjaka rock.—When running along the coast from the southward for Nosi Hao anchorage, it is necessary to avoid this detached rock, which shows at low water and lies $2\frac{7}{10}$ miles N.W. by W. $\frac{3}{4}$ W. from Lamboharana point, the northern point of entrance to Fanemotra bay, and about $1\frac{3}{4}$ miles northward of the North extreme of Vatomandefoka reef, between which and it there is said to be a clear passage; though the chart shows another rock called the Whale rock, but marked E.D., and the latest French accounts make no mention of any such danger. There is very deep water close outside the Mpanjaka rock, and in fine weather the sea breaks but slightly.

Vatomandefoka reef extends $2\frac{1}{2}$ miles N.N.W. $\frac{1}{2}$ W. from Mananonoka point, on the southern side of the bay; its northern extreme bears W. by S., distant $2\frac{3}{4}$ miles from Lamboharana point; the sea breaks heavily on it.

Coast.—About 2 miles eastward of the north entrance of Nosi Hao, and fronting Point Andavaloaka, is a large black perforated rock; behind this rock is a sandy shallow creek, and at its head stands the village of Andavaloaka. Antseranambe point is rocky, and, southward of it is a sandy beach bordered by downs covered with casuarinas, and then comes the village Ampasilavadambao. From thence to Fanemotra bay, the coast becomes rocky, with wooded hills in the background.

FANEMOTRA or **Murderer's bay** (*Lat. 22° 12' S., Long. 43° 15' E.*) is nearly a mile wide between the points of entrance, but the passage is reduced to less than half that width by rocks on each side. Though the space within is 6 miles in length and from 4 to 5 miles wide, a very small part has sufficient depth for anchorage for the smallest vessels; the head of the bay being in fact the estuary of the River Andoatanga, whose waters find their way to the sea through the shallows.

The position may be known from the offing by its northern point Lamboharana, of moderate height, at its southern extreme terminating in a small peak about 61 feet high: also by a white cliff close to the southward and by still higher barren hills a little farther southward commencing at Mananonoka point. The northern entrance point is in reality part of an island, it being separated from the mainland by a boat channel, on the banks of which is the village of Lamboharana.

Small vessels desiring to visit the bay should steer about E. $\frac{1}{2}$ S. through the centre of the passage; then, while inclining to the northward, anchor immediately Lamboharana point is passed, at about

General charts 760, 597, 748a.

Chart 760, Cape St. Mary to Beavato island. Var. 13° 30' W.

3 cables from it, in from $4\frac{1}{2}$ to $1\frac{1}{2}$ fathoms; here they will be sufficiently protected and the sea generally smooth.

Inhabitants.—The province of Tulléar is inhabited principally by the Bara tribe, who rear cattle; along the coast are many Vezos, a branch of the Sakalava tribe, good fishermen and sailors. In 1909 the total population was 183,679, of whom 308 were Europeans and 376 Asiatics or Africans.

Coast.—From Fanemotra bay to Mamirano bay, 12 miles to the southward, is a series of jagged and eccentric-shaped hills with rocky coastline. Just northward of the latter bay, the reefs break away from the coast, forming a barrier reef at from one to 4 miles from the coast reef, outside of which the water is too deep to admit of anchorage. Mananonoka point is high and white; a little farther South is another point, Tala point, low, dark, and rocky, from which the barrier reef commences and continues with but little intermission as far as St. Augustine bay, a distance of about 115 miles. There are many openings in this barrier reef by which boats and small craft can enter and navigate the smooth water inner channel, sheltered from the sea.

Southward of the low dark point just mentioned, in lat. $22^{\circ} 25'$ S. and close to the coast, are the two Quoin rocks, very near each other, and so named from their resemblance in form to gunners' quoins.

Here the coast receding forms Mamirano bay, in which are places with 4 or 5 fathoms; there appears also to be a passage through the barrier reef giving access to this bay, but it has not been examined.

Continuing to the southward, the mountains retire farther into the interior, and the coast again assumes a most monotonous and uninteresting character, without landmark of any sort until near Manombo.

Manombo, or Mahanombi (*Lat. $22^{\circ} 59'$ S., Long. $43^{\circ} 27'$ E.*), is immediately southward of Milikoka point, and the locality may be known from a distance by Manombo hill; here also the barrier reef approaches to within less than a mile from the coast, but when southward of Manombo it first connects with the shore and then again opens out, and, with slight interruptions, continues to the southward, until it joins the northern point of entrance to Tulléar bay.

Manombo village is a large and rather important place at the mouth of the river of the same name; it is, in fact, three villages, the principal one being on the right bank at the entrance, and standing on moderately high ground, the two others are northward and southward of the main village, the latter being southward of the river and consisting of a few huts only. At half a mile northward of the river's mouth is a conspicuous Norwegian mission chapel with pointed metallic roof. Ambohibé hill, which dominates the village, and on which is the Rova or

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island. Var. 13° 40' W.

government station, where the French flag is hoisted, also serves as a good landmark.

The mouth of the river has no depth, and is not well defined; it is all but dry at low water, without even a boat channel, and is commonly forded by the natives at nearly all times of tide. Opposite the mouth is a passage through the reef for boats, inside of which a landing may be effected on any part of the coast.

Anchorage.—There is anchorage fronting the river entrance in the bay formed by the break in the barrier reef, with fairly good holding ground, but only fit for fine weather. The French surveying vessel *Surprise* anchored in from 4 to 5 fathoms, sand, with the Norwegian mission chapel bearing N. 19° E. and the Custom-house S. 60° E.

PORT RANOBE (*Lat. 23° 5' S., Long. 43° 32' E.*).—The barrier reef above described, is connected with the shore reef at Toni point, just southward of Manombo, but has boat passages through it known and used by the natives at high water. From thence curving round from S.W. to S.E. it encloses this reef-formed basin, some 7 miles long by 4 miles wide. The barrier reef is pierced on the outside in two places, forming two passes into the port, which is said to be one of the best anchorages on the coast, but difficult of access, and without village or resource of any kind. In it are several coral heads uncovering about 3 feet at low water, but all easily seen at high tide by the discoloration of the water.

Toni point, at the northern end of the port, may be known by a conspicuous hill near it with sharply-defined steps or ridges showing above the trees. From this point, mangroves fringe the shore for 4 miles to the southward; then come a series of wooded nipples, with a coastline of sandy bays and rocky points below them. On the southern side of the basin is a square-shaped hill crowned with a few casuarinas, useful as a mark.

Leading beacon.—A pole beacon, 60 feet high, and surmounted by a white T-shaped mark, is erected in Port Ranobé, but its position is unknown, and the mark (Fall of Manombo) with which it has to be kept in line in order to lead through the Fanandomotra pass is not shown on chart.

Passes.—The two passes leading into Port Ranobé are the Fanandomotra and the Marohazo passes. The former is available for shipping, but is safe in fine weather only, on account of the strong tides and sea which in bad weather make it impossible to distinguish the lines of breakers marking the reefs. The navigable width of this pass is 400 yards; it is 4½ miles distant from the coast, and must be entered by the eye and lead as the only guides unless the leading beacon men-

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island. Var. 13° 40' W.

tioned above can be made use of. The depth decreases rapidly from 13 and 7 fathoms to $4\frac{1}{2}$ and 5 fathoms. Good anchorage may be found just inside and northward of the pass, in 4 or 5 fathoms, sand, carefully avoiding the numerous coral heads, with Toni hill bearing about N. $\frac{1}{2}$ W. The best time for entering, regard being had to the position of the sun for seeing the reefs, is about an hour before low water, and for leaving, about high water.

Marohazo, the second and southern pass, known also as the False entrance, is 4 miles southward of the other, and nearly 3 miles off-shore; it is not more than one cable wide, and leads into a small space free from danger, apparently having but little connection with the ship anchorage of Port Ranobé; it can at the best only be considered as a boat passage, and by no means to be taken by a stranger.

Tides and Tidal streams.—It is high water, full and change, at Port Ranobé, at 6h.; springs range about 9 feet. The streams, though violent and producing strong tide rips in the pass, are weak within, not exceeding three-quarters of a knot, and both streams run strongest at half tide, the flood setting northward and running until one hour after high water, the ebb in the contrary direction and ceasing at low water.

Directions.—Approaching Port Ranobé from seaward, the land should be made to the southward, then bring Manombo hill to bear about N.E. and steer for it until the Fanandomotra pass is distinguished from the masthead, care being taken not to mistake the Marohazo pass for it. The vessel should be coned from the masthead in order that the dangers may be perceived and the channel followed; when there is not much sea the bottom may be seen in 6 or 7 fathoms. If from the northward, there should be no difficulty in finding the entrance by coasting along near the edge of the reef.

Coast.—At Andoliatanga point (*Lat. 23° 12' S., Long. 43° 36' E.*), about 3 miles southward of the Mahorazo boat pass, the outer reef becomes connected with the shore, and so remains for about 7 miles to the delta of the Fiherenana river, off which it again commences as a barrier reef, and lasts for another 10 miles to St. Augustine bay, enclosing within it Tulléar channel and bay, and the inner passage to St. Augustine bay, as presently described; the outer edge of this reef is everywhere steep to and safe of approach to a distance of 5 cables. The coast in this vicinity is sandy, rising to low hills, some with very scanty vegetation, others with none.

Plan 692, St. Augustine and Tulléar bays.

TULLÉAR BAY and CHANNEL.—The delta of the Fiherenana river is subject to great changes; it now comprises the large

General charts 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. 14° W.

sandy islet of Anosi on the East, and mangrove swamps extending to Anosi point on the West. On the south-western side of the islet are two small hillocks, on which stands the village of Anosi. About 8 cables to the westward is Anosi point, low, and extending about half a mile to the south-eastward; on the point is a beacon.

The position of the river may be recognised from seaward by a gap in the hills at the back. The town of Tulléar is on the mainland just eastward of Anosi islet, and as far as Mahavatra point, nearly 2 miles to the southward, the coast consists of rather remarkable sandhills; from thence, for 4 miles, to Kilibé point, it is lined with mangroves, and from Kilibé point southward it is for some distance low and wooded.

The town of Tulléar or Ankatsaoka is on low sandy ground, slightly wooded, the high land being some 5 miles inland, but becoming lower and joining the coast 2 or 3 miles northward of St. Augustine bay. The town consists of a long line of native cottages, amongst which may be seen from the anchorage in Tulléar bay the Norwegian mission church, with its pointed bell-tower; also the residence, the highest building in the town, surrounded by a verandah, with the flagstaff about 20 yards southward of it, and usually the French flag flying; and the military commandant's house, surrounded by a verandah, which stands on a sandhill at the south extreme of the town; a few traders' cottages, of a better class than the ordinary native cottage, may be seen in the southern part of the town. A stone jetty is being built south of the Residency.

Tulléar is the chief town of the province, and the centre of trade; in 1909 it had a population of 9,300, of whom 300 were Europeans. The principal industries are cattle rearing and boat building. Ostrich farming was introduced by the Government in 1907, and has proved very successful.

In 1910, the value of the imports was £38,143, and exports £107,048; 394 vessels entered the port, of a total tonnage of 41,106 tons.

At the northern entrance, and as far southward as Befotaka point, the shore reef dries out 5 cables at low water; southward of this it dries out much farther, increasing suddenly to a drying or scarcely covered width of $1\frac{1}{2}$ miles, and then gradually to $2\frac{1}{2}$ miles about that distance northward of Sarondrano point, abreast and north-westward of which these reefs extend from 5 cables to $1\frac{1}{4}$ miles.

Sarondrano point (*Lat. 23° 30' S., Long. 43° 44' E.*).—Before arriving at St. Augustine bay, the coastline gradually assumes a S.W. by S. direction, and then extends a spur $1\frac{1}{4}$ miles long in a northerly direction, the extreme of which is named Sarondrano point,

General charts 760, 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. 14° W.

for the present rendered conspicuous by a remarkable tree on it having two heads; and about 600 yards from the extreme stands the village of the same name, where a boat can always land through a break in the reef, at or above half tide. This point also gives the name to the southern pass between the barrier or Great reef and the shore reefs, leading into the inner channel.

Mainia or Table hill.—When approaching the coast from the westward, this remarkable hill will be seen about $2\frac{1}{2}$ miles inland from the coast just southward of Kilibé point, and about half-way between Tulléar and Sarondrano point; it is not so high as the hills behind it, but generally stands out plainly, showing a flat summit, perfectly horizontal except for a very slight rise at each end. When seen from northward of West it appears flat, without the rise at either end; from Nosi Véi and the south-westward it shows as two distinct hills close together, the higher of the two having a flat table summit, the other being narrower. From the anchorage in St. Augustine bay, the two hills are quite distinct.

Depths.—In Tulléar channel there is a depth of from 8 to 11 fathoms; in South pass there is a depth of from 5 to $6\frac{1}{2}$ fathoms; in the Inner channel $3\frac{1}{4}$ fathoms; and at the anchorage off the village $4\frac{1}{2}$ fathoms.

Great reef.—This reef forms and protects the seaward side of the anchorage and channel; it commences about $1\frac{1}{4}$ miles W.S.W. from Anosi point, and extends from thence in a curve about 10 miles in a S. by E. direction, with a width varying from 5 cables to nearly 2 miles; the southern part uncovers at low water, springs.

Beacons.—At the northern end and inner side of the Great reef (*Lat. $23^{\circ} 21' S.$, Long. $43^{\circ} 36' E.$*), stands a beacon consisting of an iron spindle surmounted by a ball. It is situated $2\frac{8}{10}$ miles N. $77^{\circ} W.$ from Tulléar spire.

On Anosi point, at the east side of Tulléar channel, stands a wooden tripod beacon, 33 feet high; it is $1\frac{7}{10}$ miles N. $74^{\circ} W.$ from Tulléar spire.

A pole beacon, Mahavatsi, about 36 feet high, surmounted by a diamond-shape, painted white, is situated on the coast N. $53^{\circ} W.$ from Table mountain. This beacon in line with Table mountain, leads to the entrance of Tulléar channel. The beacon is difficult to see in the morning, but very visible in the afternoon.

Tulléar (Ankatsaoka) channel.—Between the northern extreme of the Great reef and the shore reef, the safe passage is about $2\frac{1}{2}$ cables wide, with a depth at the entrance of from 10 to 16 fathoms, decreasing farther in to 9, 8, and 6 fathoms, mud.

Buoy.—A black buoy, with a cylindrical topmark, is moored on

General charts 760, 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. 14° W.

the edge of the 5-fathoms line on the eastern side of Tulléar channel, at 2½ miles N. 71° W. from Tulléar spire.

Wreck.—The wreck of the *Tulear*, with two masts showing always and hull at low water, lies 2 cables S. 24° W. from Anosi beacon.

Directions.—To enter keep Mahavatsi beacon in line with Table hill bearing S. 53° E. until Great Reef beacon bears S. 40° W., when steer S. 29° E., leaving the black buoy one cable on the port hand; when Table hill bears S. 57° E., steer for it and anchor as recommended.

The entrance is not always easy to make, especially in bad weather; in which case it is safe to make the Great reef a little southward of the entrance, and then steer along it northward until the northern end is reached and rounded into the pass. By attempting to make the pass from the northward in unfavourable weather, it would be quite possible to make the fatal mistake of supposing the small bay northward of Anosi point to be the entrance of the pass. In fine weather, the reefs may be clearly seen from the masthead or foreyard, though the water is sometimes turbid after rough weather.

Inner channel.—Buoys.—The following three buoys have been established to mark the Inner channel: Serpent buoy, black, with a cylindrical topmark, moored in 20 feet of water, at 1¼ miles N. 76° W. from Befotaka point; Angele buoy, black, with a conical topmark, moored in 18 feet of water, at 2½ miles S. 20° W. from Befotaka point; and Microbe buoy, red, with a conical topmark, moored in 21 feet of water, on the south-west edge of Microbe rocks, at about 5½ miles S. 9° W. from Befotaka point.

Directions.—Proceeding southward through the Inner channel, bring Serpent buoy to bear S. 32° E., and after clearing the spit, with 2½ fathoms over it, lying N.W. 2½ cables from the buoy, round the buoy, leaving it a quarter of a cable on the starboard hand; then steer S. 5° E. until Table hill bears East, when alter course to S. 31° E., leaving Angele buoy a quarter of a cable on the starboard hand; after Angele buoy is passed steer South until Microbe buoy is sighted ahead, when change course to pass 3 cables westward of it, and when Table hill bears N. 54° E. steer through the South pass on this bearing.

Caution.—The buoys in the channel are not very securely moored, so must not be implicitly relied on. Discoloured water is visible in many places, and does not necessarily show the edges of the channel.

South or Sarondrano pass (*Lat. 23°30' S., Long. 43°42' E.*), between the reefs extending westward of Sarondrano point and the southern end of the Great reef, has a clear navigable width of 7 cables, with depths of from 5 to 6½ fathoms, though 5 or 6 cables southward of

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Plan 692, St. Augustine and Tulléar bays. Var. 14° 10' W.

the reefs there is no bottom with 100 fathoms. To enter, steer for Table hill, bearing N. 54° E., and, on passing the southern end of the Great reef, when Microbe buoy bears N. 31° E. steer N. 12° E. and follow the directions previously given.

Anchorage.—The anchorage in Tulléar bay and channel is well protected and safe at all seasons, having depths of from 3½ to 10 fathoms over a soft muddy bottom, throughout a length of 9 miles, and an available width of nearly one mile between the reefs in most parts with a passage at each end. The anchorage off the town is in about 4½ fathoms, with the Residency flagstaff bearing N. 61° E.

Limits of port are included between the Commercial square to the north and the jetty to the south, both points included; no work, of shipping or landing cargo, is permitted outside these limits.

Landing (*Lat. 23° 22' S., Long. 43° 40' E.*).—At 1½ cables south of the Residency flagstaff a stone jetty is being built; 300 yards of it is completed, and there is enough water alongside for it to be used at half tide and near low water neaps. It is proposed to extend it, but until completed landing must be effected, at low water, on the sand 100 yards from the end.

Tides and Tidal streams.—It is high water, full and change, in Tulléar bay, at 5h. 29m.; springs rise 8½ feet, neaps 5½ feet. The tidal streams during the dry season were found at ordinary springs to set as follows:—Half a mile inside the entrance; half ebb and low water, N.W. by N. 1½ knots; half flood and high water, South: 1½ miles inside the entrance and near Great reef; half ebb, North; low water, N.E. by N.; half flood and high water, E.S.E.: Near the anchorage; half ebb and low water, N. by W.; half flood and high water, S.S.E., at half a knot: Near Angele buoy; low water, N.E. by N.; half flood, N.E. by E.; high water and half ebb, S.W. by S.: About half a mile northward of Microbe buoy; low water and half flood, N.E. by N.; high water, South; half ebb, S.W. by S.: About three-quarters of a mile inside South pass; low water, slack water; half flood, N.E. by N., at half a knot; high water, South; half ebb, S.W.

The streams are generally weak, and influenced by the winds.

The strongest tidal stream is found off the Great reef beacon; it runs there at springs at the rate of 2 knots.

Pilots.—Natives may generally be found to offer themselves as pilots; they are said to be acquainted with the local dangers, and are employed by merchant vessels.

Wind and weather.—The rainy season in this region is from November to March, both months inclusive; and south-westerly winds prevail all the year round, which, freshening during the afternoon, render landing then difficult, as at most other places on this coast; see also page 457.

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Plan 692, St. Augustine and Tulléar bays. Var. 14° 10' W.

Communication.—The Messageries branch steamer between Majunga and Durban calls here, outward bound, the 6th or 7th of each month, and returning, on the 17th; the branch East Coast steamer from Diego Suarez calls here once every two months.

Tulléar is in telegraphic communication with Antananarivo, and thence with all the world.

Supplies.—Beef of good quality and fish may always be procured, vegetables and fruit in most seasons, and poultry and eggs in abundance sometimes. No drinking water can be obtained.

ST. AUGUSTINE BAY (*Lat. 23° 33' S., Long. 43° 42' E.*) comprises the space between the south-western extreme of the Great reef and the projecting land 6 miles farther South; from which line it recedes nearly 6 miles to the entrance of the River Onilahé at its head. The coast from Sarondrano point trends southward, being low, sandy, and bordered by a fringing reef which dries out from 5 cables at its northern part to 2½ cables just before it terminates, where the coast turns south-westward for about one mile, ending in Barn hill, a long tongue of land 193 feet high and not more than 220 yards wide. The white chalky cliffs of this hill when lighted up by the sun are seen at a great distance. The little bay of Tambohabo on its eastern side, is shallow and exposed to the sea, and, together with the plateau running off from it, is unsuitable for anchorage even for small craft.

Onilahé or St. Augustine river takes its rise more than a hundred miles in the interior, and, after a very devious course of nearly thrice that distance, falls into St. Augustine bay about a mile south-eastward of Barn hill. The entrance, under ordinary circumstances about 600 yards wide, is usually barred across the whole width by a quicksand, over which the depth at low water, springs, is usually from one to 3 feet, though sometimes the channel has as much as 6 feet, and during the rainy season it frequently overflows. Immediately outside the entrance points, this sand-bar is so steep towards the sea that within a distance of 2 cables it deepens from 2 or 3 feet to 10, 20, and 30 fathoms. The water at one mile within the bar is fresh after half ebb. The river is navigable for canoes at all seasons as far as Benenitra, a distance of about 130 miles.

The northern entrance point of the river is a low sandy point, the termination of a very narrow ridge, which, commencing at the northern inner end of Barn hill, also forms the eastern side of Tambohabo bay. In the middle of it is the large village of that name. Tambohabo point, the southern extreme of this ridge, is subject to great changes of form caused by freshets and floods during the rainy season.

Ampasimanoro point, the southern point of entrance, is low

General charts 760, 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. 14° 10' W.

and sandy, and on it is the village of the same name, immediately in rear of which are cliffs which also form the southern bank of the river for some distance. They again extend south-westward to and beyond the valley and village of Lovocampi, where they become lower. This valley causes a break in the cliffs about 600 yards wide, where there is a sandy beach. The valley is cultivated, and has many fresh-water pools, swarming with alligators. At the western point of the break is a large rock separated from the cliffs, which extend a mile farther westward to the Tent rock. All these cliffs being white show up well when the sun is shining on them.

Andriamilahi (Tent rock) (*Lat. 23° 36' S., Long. 43° 43' E.*), at the western end of the cliffs, is about 13 feet high, and is the largest of two detached rocks close together, which may be distinctly seen at a distance of 2 miles. From this rock, a line of hills covered with impenetrable scrub runs southward into the interior, and the coast following a circuit of 7½ miles to Anakao point, is flat and sandy, with a curtain of trees in the background.

This part of the coast has a fringing reef from 4 to 6 cables wide, but with a boat passage inside it at parts, and a break where it does not quite dry at low water in front of Saolara village, which village commences about half a mile westward of the Tent rock and extends 700 or 800 yards along the shore; at its eastern end is a large store. Behind the village is a well of indifferent water. About 3½ miles westward of Saolara, off the north-western part of the shore reef, is a detached bank with as little as 6½ fathoms; it should be avoided, as in heavy weather the sea has been observed to break on it.

Directions.—When coming from the northward, before Table hill is visible, a conspicuous hill will be seen to the northward of it, apparently the termination of a mountain range; also the remarkable gap in the land forming the bed of the River Fiherenana. After Table hill, Barn hill will be seen, and then the entrance of the River Onilahé; bearings of the former serve well to guide a vessel past the reefs. When approaching from the westward or south-westward the great depression in the mountain range through which the Onilahé flows indicates the position; there is no other such depression between it and Cape St. Mary.

Anchorage.—The water throughout St. Augustine bay is of great depth until close inshore; a berth should therefore be chosen according to the season. From April to October a vessel may anchor off Saolara village, in about 9 fathoms, stiff black mud and good holding ground, with Ampasimanoro point bearing E. ¼ N., and Tent rock S.S.E. ¼ E.; at other seasons, they should anchor farther out in 15 or 16 fathoms. The swell sometimes causes vessels to roll heavily.

General charts 760, 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. 14° 10' W.

After September sailing vessels should not anchor in this berth at all, but take up a position within the Sarondrano pass, where there is always good shelter afforded by the Great reef, and consequently smooth water.

Tidal streams.—Along the southern side of the bay, the flood sets eastward about a quarter of a knot; the ebb, westward at half a knot.

Landing (*Lat. 23° 35' S., Long. 43° 42' E.*).—The reefs protect the shore, and boats can land with ease. The western end of Saolara village can be approached at all times of tide through the large opening in the reef. The landing in front of Tent rock is impeded by shoals at low water.

Supplies, trade, &c.—A few bullocks, sheep, and fowls are obtainable at Saolara or up the river; also a few beans, but other vegetables are scarce. Good water may be obtained about a mile up the river after half ebb; but, as the result of rains, it may be muddy and require time to settle before being fit for use. Beef is salted for export to Réunion and Mauritius.

LOCAL WINDS and WEATHER.—From Fanemotra to St. Augustine bay, climatic conditions appear to be very similar according to the latest observations, and especially those of the French war vessel *Scorpion*, made during the years 1898, 1899, and 1900.

When the sea breeze is from the southward, it is usually strong, and blows for three days together without any land breeze. A red sunset, cloudy sky, and misty pale sun in the morning, are indications of this strong breeze. A grey horizon to seaward generally precedes a strong sea breeze. The barometer does not foretell the approach of northerly or southerly winds, but it falls or rises respectively with those winds, and with strong southerly winds it usually stands higher than 30.16. During six weeks from the 1st September, it ranged between 30.25 and 29.88 inches. With a relatively low barometer and moisture in the afternoon, a north-westerly wind may be expected the next day.

The fine season begins to break up and the weather becomes unsettled about the middle of October. North-westerly gales, of moderate strength and lasting for two or three days, may be expected to commence in November, and they blow hardest when they veer to West or S.W. In February gales are frequent with much rain, but not so much as farther North. In March, which the natives say is the month of most wind, it often blows for days together from S.W. or South, but generally moderating about midnight and freshening again a few hours afterwards. The ordinary winds during this season are from North to East, always light, and alternating with calms and light southerly or south-westerly breezes.

General charts 760, 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. $14^{\circ} 30'$ W.

In the fine season, fresh breezes seldom last longer than a couple of hours; the winds are then generally between S.S.W. and S.S.E. by day, and off the land by night. Humidity and a low barometer always precede light breezes from between West and N.N.W.

Cyclones appear to be quite unknown on this part of the coast.

Anakao point (*Lat. $23^{\circ} 40'$ S., Long. $43^{\circ} 38'$ E.*), following the curve of the coastline round westward and south-westward from St. Augustine bay, is about 8 miles distant from the Tent rock. It is a low, rocky, but well-defined point, with reef extending 8 cables north-westward of it, and much farther than that when southward of the point. At about one mile north-eastward of the point is a village, to which a break in the reef gives access for boats. A second village, hidden by trees, lies a short distance inland, where large herds of cattle are reared and owned. The natives of this part have a bad reputation.

NOSI VEI (*Lat. $23^{\circ} 38'$ S., Long. $43^{\circ} 36'$ E.*).—At the southern side of the entrance to St. Augustine bay, and 2 miles from the nearest coast, is this island, 8 cables long N. by W. and S. by E., and $2\frac{1}{2}$ cables wide at its southern end, composed principally of white sand and covered with low bush, except at the northern end, where there is a small cluster of casuarinas. This island, which had a considerable colony, was abandoned in 1900, the inhabitants moving to Tulléar. Nothing remains except the cemetery and ruins of two huts in the middle of the island, even the sites of the former buildings are grown over. The transit of Venus pillar, at the south-east corner, marking the spot where the transit observations were taken in 1882 (*lat. $23^{\circ} 38' 52''$ S., long. $43^{\circ} 36' 4''$ E.*) was destroyed, but a second pillar, visible from the anchorage, has been erected 108 yards S. 36° W. from the former one.

The island is enclosed by a reef which extends $1\frac{1}{4}$ miles to the northward, and nearly a mile southward and westward; outside the reef in the latter direction the water deepens rapidly, on the eastern side the reef is narrow. A bank of sand and coral extends $1\frac{1}{2}$ miles from the north-eastern corner of the reef; $4\frac{3}{4}$ fathoms is the least known depth, but the sea breaks heavily on it in bad weather. Sandbanks seem to be extending also north-westward from the island, but its western coast is reported to be wasting away.

Anchorage.—Landing.—The passage inside the island is 6 cables wide between the reefs, at the southern end, with depths of from 12 to 7 fathoms. The northern channel is much wider, but the depth is only from 5 to $3\frac{1}{2}$ fathoms. The best anchorage is north-east of the island in $5\frac{1}{2}$ fathoms, sand and coral, with the north point

General charts 760, 597, 748a.

Plan 692, St. Augustine and Tulléar bays. Var. $14^{\circ} 30'$ W.

bearing S. 88° W. and the south point S. 29° W. At high water landing is easy anywhere, at other times of tide the best landing is about 100 yards north of the ruined huts.

Tides and tidal streams.—It is high water, full and change, at 5h. 50m.; springs rise $10\frac{1}{2}$ feet, neaps $7\frac{1}{4}$ feet. The flood stream runs N. by W.; the ebb, S. by E. The maximum rate is one knot at half-tide.

Chart 760, Cape St. Mary to Bevato island.

COAST.—The level plain which commences in the vicinity of the Tent rock, borders the coast for about 100 miles towards Cape St. Mary, rising by three distinct steps or ranges of hills parallel with the coast to a table land averaging from 1,000 to 1,400 feet above the level of the sea; the nearest range to the coast being about 5 miles, the farthest from 13 to 15 miles inland. From St. Augustine bay as far as lat. $24^{\circ} 30'$ S., the coast trends about S. by W., and near the coast are some sand dunes of moderate height; a few trees on them are the only signs of vegetation near the sea. In the northern part of this space, the coast is fringed by a rather wide coral reef, on the outer part of which, at 4 miles S. $\frac{1}{2}$ E. from Nosi Vei and 2 miles from the shore, is a rock called Nosi Satrana. It is said that there is no passage through the reef even for boats; the sea breaks a great distance off-shore in some places, and the reef is generally steep-to. South of lat. 24° S. the reef becomes narrower, rarely exceeding 5 cables in width until the vicinity of Port Androka is reached.

The Lanivato cliffs, shown on the chart in lat. $24^{\circ} 15'$ S. are merely sand-dunes rather higher than those northward or southward of them, but when some little distance off-shore the effect of mirage sometimes gives them the appearance of cliffs. About 5 miles inland at this part is the centre of the salt water lake of Tsimanampetsotsi, which is from one to 2 miles wide, and runs parallel with the coast for about 22 miles between the nearest range of downs and the sea.

Itampolo creek (Lat. $24^{\circ} 40'$ S., Long. $43^{\circ} 53'$ E.) is a small anchorage on the northern side of a slightly projecting point surrounded by reefs. In the elbow northward of the point is a depth of from 8 to 5 fathoms, sand. Here a vessel is sheltered from the ordinary sea breeze between South and West, but is exposed to the most dangerous winds from between North and West. The only landmark from the offing is a round hill in the second line of heights, and it disappears behind the first line of hills as the coast is approached from the westward. A military post, with flagstaff, is established on the crest of a sand-dune, northward of the point, near a conspicuous tamarind tree; a few hundred yards to the northward the dune declines in

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island. Var. 14° 50' W.

height, and a grove of casuarinas borders the sea beach. There are many villages in sight in this neighbourhood.

Anchorage, &c.—A vessel of moderate draught may run in with the flagstaff bearing E. $\frac{1}{2}$ S.; this clears the breakers off the point, and when abreast of the point, haul in to starboard and anchor with the flagstaff bearing E. by N. $\frac{3}{4}$ E., and the South point between South and S.S.W. according to draught. Boats will find convenient landing abreast of the flagstaff by turning round the end of a reef which here shelters the beach.

Southward of Itampolo there is a low coast of white sand bordered with coral reefs. Within, there is a plain from 5 to 8 miles wide to the foot of the hills, which rise from it generally as cliffs. There are no outlying dangers in this part.

Lengorano point and anchorages.—Lengorano point may be known by a few clumps of casuarinas, and about 2 miles northward of it commences the great reef, which, for about 10 miles, fronts the coast and shelters the three anchorages of Lengorano, Androka, and Ambohibola. These three anchorages, lying close together, offer between them perfect shelter against all winds; the first against winds from the southward, the second from off-shore winds, and the third from northerly winds. Lengorano anchorage lies between the northern end of the great reef and the shore, and has a depth of about 6 fathoms. About one mile northward of the anchorage is an isolated reef, some 550 yards in extent, round which the French ship *Sagittaire* steamed without finding less water than $5\frac{1}{2}$ fathoms. The anchorage is well sheltered, except from West to North. Small craft cross over the shoal connecting the great reef with the shore to the southward, and thus enter Port Androka from this anchorage.

Barracouta islet (Nosi Borona) (*Lat. 25° 41' S., Long. 44° 6' E.*), about 27 miles from Itampolo, is flat, sandy, and surrounded by reefs. It lies off Port Androka, and there is a wide passage with from 10 to 15 fathoms between its reefs and those forming that port.

Port Androka.—Within the reef which borders the coast, just southward of Lengorano point, is a space receding in a N.N.E. direction nearly in the form of a pear; it is $1\frac{1}{2}$ miles long, $7\frac{1}{2}$ cables wide inside, and about $4\frac{1}{2}$ cables in the entrance, which is open to the S.W., and across which is a bar with from $3\frac{3}{4}$ to $5\frac{1}{2}$ fathoms, but it has not been closely examined. Vessels anchor in 5 or 6 fathoms with Barracouta islet bearing S.W. and Lengorano point N. by W. $\frac{1}{4}$ W.; the bottom is generally muddy sand, but there are some scattered patches of coral, which, by their dark colour, show plainly in calm weather. The landing is at the head of the harbour, near the village of Masikoro,

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island. Var. 15° W.

where the French government has a military post. When ships' boats cannot beach they should anchor close in, and effect a landing by means of canoes.

The River Masikoro or Linta flows into a creek about $1\frac{1}{2}$ miles south-eastward of the anchorage. It is a shallow inconsiderable stream even after rains. It is stated that fossil eggs of an enormous bird of extinct species, *Æpyornis*, have been found in the silt of this river; see page 230.

Directions.—To enter Port Androka, a vessel may pass inside or outside of Barracouta islet, giving a berth to its breakers in passing; then steering for the entrance, and anchoring in the berth already described, but not in less than $4\frac{1}{2}$ fathoms. This anchorage affords excellent shelter except against wind and swell from between S.W. and N.W.

Tides.—It is high water, full and change, in Port Androka, at about 5h. 20m.; springs range about $6\frac{1}{2}$ feet.

Port Cruiser or Ambohibola.—From Port Androka the coast reef continues 5 miles to the southward, enclosing a rounded point, within which the coast forms this indentation, which lies open to the southward, but affords excellent shelter from all other winds, in from 8 to $4\frac{1}{2}$ fathoms, the depths decreasing gradually. At high water, small craft pass between this bay, Port Androka, and Lengorano anchorage, inside the reef.

Croker or Ampalazi or Miniurodo bay.—From Port Cruiser, the coast trends S.E. by S. for 12 miles, and then turns westward, forming Barrow or Fenambosi point, about 18 miles from Barracouta islet. Barrow point, as well as the neighbouring land, is very low, ending in a narrow tongue of rock and sand about $1\frac{1}{2}$ miles in length. Croker bay is the bight in the coast northward of the point; it has depths of from 8 to $4\frac{1}{2}$ fathoms, but as an anchorage is not recommended at any time, it being quite open to winds between North and West; whilst, at other times, the heavy south-westerly swell which always appears to prevail off Barrow point, drives in round that point and renders the position very uneasy; there are also strong tidal eddies.

Nosi Manitsa or Leven island (*Long. 25° 13' S., Long. 44° 17' E.*), off the entrance to Croker bay, bears from Barrow point N.N.W. $\frac{3}{4}$ W., and is distant $4\frac{1}{2}$ miles. It is moderately high and surrounded by reefs, but has a passage with at least $4\frac{1}{2}$ fathoms between it and the coast abreast.

Tozer patch lies $7\frac{1}{2}$ miles N.W. from Barrow point, and $3\frac{1}{4}$ miles W.N.W. from Leven island. Other shoal patches have been supposed to exist in this vicinity, but the visits of French surveying vessels have

General charts 597, 748a.

Chart 760, Cape St. Mary to Bevato island. Var. 15° W.

not revealed them. On approaching from seaward, vessels should not haul in for the land before Leven island bears about East.

Star reefs.—About 5 miles S.W. by W. from Barrow point commence the detached coral reefs which extend from thence 8 or 10 miles to the southward, close to the edge of soundings, and steep to on their western sides, leaving a wide passage between them and Barrow point, which latter should be given a berth of one or 2 miles.

Star bank, on the north-western edge of which the Star reefs, just described, are situate, occupies the whole distance, about 47 miles, fronting the coast between Barrow point and Cape St. Mary. So far as examined, it appears to be a bank of regular soundings; in the central part, where it extends farthest from the land, there are 30 fathoms at 28 miles off-shore, the depth decreasing by very slow gradations to 17 or 18 fathoms at only 5 miles off-shore, and this appears to be the character of the whole bank as regards soundings; immediately outside the bank itself, the soundings increase suddenly to upwards of 50 or 60 fathoms, and probably to ocean depths. The eastern edge of the bank draws in towards Cape St. Mary, between which and Barrow point the coast is free from danger, there being 6 or 7 fathoms close to the coast; therefore, any vessel running along the land may safely anchor in case of need, during land winds, at 2 or 3 miles off-shore, in from 14 to 16 fathoms.

The Albatross rock (*Lat. 25° 33' S., Long. 44° 58' E.*) is 9 miles north-westward from Cape St. Mary; there is a 4-fathoms passage 3 cables wide between it and the coast.

About 10 miles north-westward of the Albatross rock, and near the mouth of the River Mearandra, are some rocks detached a short distance from the shore.

Coast.—The land westward of Cape St. Mary rises towards the interior in three distinct terraces, which continue unbroken as far as St. Augustine bay, except occasionally by the course of a river. Along the coast for many miles north-westward of the cape there is a high, yellow, sandy cliff, quite level, and barren at the summit; from it portions have broken away at singularly regular intervals, forming on the cliff a series of four-sided figures closely resembling each other.

Landing on the coast anywhere between Croker bay and Cape St. Mary is difficult at any time, and even if effected, the heavy swell, which often rises suddenly without any previous indication or apparent cause, might prevent a boat's return for an indefinite time.

Cape St. Mary consists of imposing masses of rock, which can be seen at a great distance. It will be found fully described, together with the soundings, currents, and winds in its vicinity, at pages 318, 319.

General charts 597, 748a.

ISLANDS AND DANGERS IN THE MOZAMBIQUE CHANNEL.

Chart 851, Bassas da India and Europa island. Var. 1½° W.

EUROPA ISLAND.—This island was annexed by the French government in 1897. It lies nearly in the fairway of the Mozambique channel. It is about 5 miles in length E.N.E. and W.S.W., 3 miles wide, and rises 50 to 80 feet above the sea level; it can be seen from a vessel's deck at a distance of from 12 to 15 miles. The island is composed chiefly of sand, with low hummocks in places, and the greater part is covered with trees of moderate height, bushes, and rushy grass; here and there are a few casuarina trees; *see* view on chart.

The eastern coast consists of low perpendicular cliffs, apparently steep-to. At the north-eastern side a reef extends about half a cable, and there are from 12 to 18 fathoms a cable outside it. On the northern side is a flat coral reef which dries at low water, springs, and extends from 2½ to 5 cables off-shore; in this direction H.M.S. *Penguin* had 11 fathoms, and the bottom was distinctly seen at 3 miles from the island. The coral reef is steep-to, there being no bottom with 30 fathoms within a cable of its outer edge; it is easily seen about low water, but at other times it must be approached with care. Inside this coral reef, the shore recedes, forming a bight, which opens into a lagoon at the eastern part of the northern side of the island. The lagoon extends some distance towards the southern shore, but is not more than 4 or 5 feet deep at low water.

The north-western point (*Lat. 22° 20' S., Long. 40° 19' E.*) is sandy, with low bushes; it runs off shoal and rocky from the north-western side from 5 to 8 cables, with only from 6 to 9 feet water. Approaching the island in this direction, in March, 1900, H.M.S. *Thrush* had soundings of from 85 to over 100 fathoms at from 2 to 3 miles from the coast. The western side is rocky, but apparently steep, with much surf on the beach. The southern side is low, and a reef is said to run off about a mile, perhaps farther, from the south-western side, with deep water close-to, but this is somewhat doubtful; however, this being usually the weather side of the island, must be considered unsafe of approach.

At the time of the *Thrush's* visit, the wreck of the American vessel *Mozambique*, of Boston, was lying on the south-western coast of the island.

Cyclones of great strength are reported to visit the island occasionally.

Anchorage.—There is no safe anchorage; vessels may anchor on the edge of the coral reef to leeward of the island, but without room to swing in case of a shift of wind.

Landing.—At the northern side, landing has been effected, and at the north-western point there is a small extent of steep beach, with

General charts 597, 748a.

Chart 851, Bassas da India and Europa island. Var. 13° 50' W.

good landing in moderate weather; at times, landing may also be effected on the beach between the rocks on the western side, but an attempt to land on the southern side by the boats of the *Penguin* was unsuccessful, though at the time it was the lee side of the island.

Europa island is not permanently inhabited, but is visited for fishing and for the collection of orchilla by boats fitted out at Tulléar. There being no fresh water, the fishermen have to distil from sea water. There are goats on the island and abundance of fish in the lagoon; turtle also are found during the season.

Current.—Visiting this island in November, 1875, H.M.S. *Flying Fish* found a current setting past it to the north-westward at from 2 to 2½ knots, causing tide ripples, eddies, and in some places almost a race. The current in this neighbourhood is exceedingly variable, both in direction and force, rendering constant observations necessary to check a vessel's position.

BASSAS DA INDIA, sometimes called Europa rocks, or Baxos da India, were discovered by the vessel *Europa* in 1774. The reef was examined in 1878 by Commander Wharton, H.M. surveying ship *Fawn*, whose observations place the eastern point of the reef in lat. 21° 27¼' S., long. 39° 45½' E.

Bassas da India is a circular coral reef about 9 miles in diameter, enclosing a shallow central lagoon; there are some small rocks from 7 to 10 feet above high water on the northern and eastern sides of the reef; the western and southern sides dry 4 feet at low water, and most of the remainder dries at that time. The reef is steep-to; several anchors lie on it, showing all that remains of former wrecks. A schooner, bottom up, was seen in the lagoon by H.M.S. *Osprey* in 1883. Soundings of 720 fathoms, sand, were obtained at one mile from the western side of the reef; 470 fathoms, sand, a mile from the northern side, and 200 fathoms 7 or 8 cables from the southern side. The sea breaks heavily on the reef, which may be seen from a vessel's masthead, in clear weather, about 10 miles distant.

A pass, apparently practicable for boats, at high water, appears to exist on the eastern side of the reef. The waters of the lagoon are of a characteristic bright green colour, contrasting strongly with the deep blue of that outside. There is no anchorage anywhere round this reef.

Pilot shoal was reported in 1850 by Captain White, of the American whaling barque *Pilot*, as being in lat. 21° 10' S., long. 38° 57½' E. At 7-30 a.m. on January 5th, the vessel passed over the end of a shoal, with, as it was assumed, not more than 3 fathoms over it, as the bottom was distinctly seen; at the same time several patches to windward were observed, which looked nearer the surface;

General charts 597, 748a.

Chart 851, Bassas da India and Europa island. Var. 13° 50' W.

the whole extent of the shoal was estimated to be from $1\frac{1}{2}$ to 2 miles, and it was said to lie N.W. by W. $\frac{3}{4}$ W. (*by compass*) a distance of 35 miles from Bassas da India, which, however, does not agree with the latitude and longitude given by Captain White.

Assuming that N.W. by W. $\frac{3}{4}$ W. (*true*) distant 35 miles from Bassas da India, was meant; an unsuccessful search, extending over a period of 4 days, was made by Commander Wharton in February, 1878. The weather was favourable and the water clear, but no soundings could be obtained on the reported position of the shoal, nor within distances of from 5 to 15 miles on all sides, nor could any sign of shoal water be seen from the masthead. A depth of 1,620 fathoms, grey mud, was obtained 3 miles south-eastward of the alleged position of the shoal.

Many vessels have passed over this alleged position, but none have succeeded in finding the shoal. The latest recorded is H.M.S. *Pearl*, in September, 1904; she took several casts with the sounding machine, but found no bottom at 100 fathoms, and saw no signs of shoal water.

General charts 597, 748a.

CHAPTER XI.

PRINCE EDWARD, CROZET, KERGUELEN, HEARD, ST. PAUL,
AND AMSTERDAM ISLANDS.

(Lat. $36^{\circ} 30'$ S. to Lat. $53^{\circ} 20'$ S.)
(Long. $37^{\circ} 30'$ E. to Long. $77^{\circ} 50'$ E.)

Variation in 1911—Increasing $1'$ to $6'$ annually.

Chart of Prince Edward islands on 802. Var. $31^{\circ} 30'$ W.

PRINCE EDWARD ISLANDS.—General remarks.—

The information relating to Prince Edward islands is chiefly from the partial examination and remarks made by Captain G. S. Nares, H.M.S. *Challenger*, in 1873; bad weather preventing a more detailed survey being made.

The latest account of these islands is by Lieut. Hobart Seymour, R.N., who visited them, March, 1910, in s.s. *Wakefield*, when searching for the lost steamer *Waratah*.

These two islands were discovered by M. Marion du Fresne, in command of a French expedition, on January 13th, 1772. Captain Cook, in his last voyage passed between them, before the particulars of the French discovery were made known, and he gave them the name of Prince Edward islands, which name is now applied to the north-easternmost of the two; that of the discoverer, M. Marion, to the island first seen by him.

The islands are now annexed, and under British Sovereignty.

Ice.—As regards the probability of meeting with ice when navigating in these regions, see page 19.

MARION ISLAND (Lat. $46^{\circ} 49'$ S., Long. $37^{\circ} 49'$ E.), the larger of the two, is about 12 miles in length by 7 miles in breadth, and rises 4,200 feet above the level of the sea; it appears from the northward as a cluster of rugged nipples, with one table-topped peak slightly higher than the rest. The land slopes down to low rocky coasts on the western, northern, and eastern sides with a steep incline, much broken by numerous volcanic cones, some with the red volcanic ash still showing near the summits.

“South cape has a perpendicular face, the termination of a terrace-like projection from the foot of the hills. Long lines of kelp extended

General chart 748a.

Chart of Prince Edward islands on 802. Var. 31° 30' W.

2 or 3 miles off East cape, while strong eddies of tide seemed to indicate dangers."—Cook.

The sides of the hills are thickly studded with lava boulders protruding through the rank boggy moss vegetation. In the month of December, 1873, the high land was completely covered with snow to within about 1,000 feet of the sea level.

Boot rock, high, and shaped like a boot, lies about 5 cables from the northern coast, about 2 miles eastward of Cape Davis; the sea was observed to break 2 or 3 cables seaward of it. See view on chart.

Reefs.—A reef, covered with kelp, extends N.E. by E. a distance of about 2 miles from the point close eastward of the landing place; there is also a small reef covered with kelp just to the westward of the landing place, and several similar ones off the north coast of the island.

Landing.—There is landing in a cove about 4 miles eastward of the Boot rock, or Prince rock as it is sometimes called, and the entrance is clear of kelp. The wreck of the s.s. *Solglimst* lies in the landing cove; her bow is the only intact part; there is other wreckage lying about, which only uncovers at low water, so caution is necessary when landing. Landing may probably be effected under favourable circumstances at other parts of the island.

Anchorage may be obtained in 16 fathoms near the landing place, at about 2½ cables from the shore, with the Boot rock shut in.

Supplies.—The Kerguelen cabbage, an edible plant, grows on the island. Albatross, seals, and penguins are seen in great numbers; the beautiful king penguin is especially common, and there are many rookeries containing thousands.

On the beach of the cove, which is composed of hard sand, are three big iron blubber tanks and a quantity of timber, also three boats hauled up. Above the beach are several well-built wooden huts, one of them having tables and stools; there is also a store hut with a cooking stove and plenty of provisions. The boats, huts, and stores probably belong to the sealers.

On the coast westward of the cove were the remains of huts, formerly occupied by parties collecting penguins' skins; one was in a cave on the hill side, immediately East of the principal lava valley, and about half a mile westward of the cove.

A few fresh-water ponds were found near the coast in hollows formed by descending streams. The largest was about 2 miles westward of the cove.

PRINCE EDWARD ISLAND (*Lat. 46° 36' S., Long. 57° 57' E.*), about 13 miles north-eastward of Marion island, is

General chart 748a.

Chart of Prince Edward islands on 802. Var. 31° 30' W.

about 15 miles in circumference, and, when sighted from the westward, shows a rounded summit 2,370 feet high, the land sloping gradually to East and South capes, but more abruptly to the northward; on the west coast the mountains run down to the sea. A wedge-shaped peak on the North point appears from a distance to be detached from the island; it is slightly higher than the prominent outlying rocky islet northward of it. The south-western point is a perpendicular cliff, 1,500 feet high, rising within a quarter of a mile of the beach.

On its eastern side is a deep bight, Cave bay, running from N.E. cape to East cape, the latter being a long low-lying point. Sealers formerly found temporary anchorage here in from 8 to 10 fathoms.

Kelp extends off the land from Ross rocks to South cape on the eastern side, but the western side is clear.

THE COMPASS.—Local magnetic disturbance.—

When near this island the s.s. *Wakefield* found her compass affected to the extent of 5°, which afterwards disappeared.

Chart of Crozet islands on 802. Var. 30° 50' W.

CROZET ISLANDS (Lat. 46° 20' S., Long. 51° 30' E.).—

General remarks.—The Crozet islands are of volcanic origin; they were discovered by M. Marion du Fresne in 1772, after leaving the Prince Edward group. They were named after Captain Crozet, the historian of the French expedition, who became second in command after the massacre of M. Marion in New Zealand. They were passed by Captain Cook in 1772, and were visited by Sir James Ross in 1840. The existing chart of these islands is from a partial survey by Lieutenant Fournier, of the French corvette *Heroine*, commanded by M. Cecille, 1838, with soundings by Captain Nares, H.M.S. *Challenger*, 1874, and some slight addition by H.M.S. *Comus*, 1880, which last-named vessel visited the islands for the purpose of establishing depôts of provisions for shipwrecked persons. The latest information is from Lieut. Hobart Seymour, R.N., who visited these islands in s.s. *Wakefield*, March, 1910.

These islands are now a French possession.

On all the islands sea elephants and seals are very numerous, also duck, teal, albatross, penguin, and other birds; rabbits are found on Hog island, and probably on the others. To shipwrecked people the skin of the sea elephant would form a good covering, and the tongues, fins, and kidneys of these enormous animals are excellent food. Sealers who have been landed on the islands appear to have been contented with such food, so that there is no danger of shipwrecked people dying of starvation. Fresh water is abundant.

Wind and weather.—(See also "Winds," page 6.) The weather in the vicinity of the Crozets and Prince Edward groups may

General chart 748a.

Chart of Crozet islands on 802. Var. 30° 50' W.

be described generally as bleak, boisterous, and foggy. The prevalent wind is westerly; but easterly winds occasionally blow for a short time, and although, generally, they do not last long or acquire much force, they have been known to wreck vessels that have taken shelter in Ship cove. Easterly winds are usually followed by violent gales and squalls from the westward. The great obstacle to navigation in the vicinity of this group is, however, the almost constant state of fog and overcast sky, which, besides concealing the islands from view, prevents the position of the vessel being ascertained; and, as icebergs have been seen near these islands in January, May, and November, this is another feature of danger to be considered by those seamen who do not follow the recommended route to Australia, about the 40th parallel.

The climate of the islands, though rigorous, appears to be equable, owing probably to the temperature of the sea, which is fairly constant at from 40° to 42°. At midsummer, the mean temperature of the air was 48° during northerly winds, and 41° with southerly winds; but it fell to 31° during a westerly gale on December 4th, 1887. The snow does not appear to attain any considerable thickness at this group; nor can the icebergs seen in their vicinity be formed on them. The weather is finer and drier on the eastern than on the western side of the islands.

Against the western coasts the almost constant westerly swell breaks heavily, and landing is generally impossible on that side; though this is not always the case, for Captain Simpson, of the s.s. *Moravian*, who has often sighted these islands, and who passed close to them on December 22nd, 1901, reported that "very little sea was breaking on them; in fact we could have landed in a ship's boat in perfect safety on any part of the islands of the group." The leeward side is naturally the most usually accessible; the best positions are mentioned in the detailed descriptions.

HOG ISLAND (*Lat. 46° 10' S., Long. 50° 10' E.*), the westernmost of the group, is nearly circular, 7 miles in diameter, about 2,000 feet high, and makes in a number of small peaks; the summit is always covered with snow. The northern point of the island is a perpendicular cliff about 200 feet high, from thence rising gradually to the foot of the hills; the western side is precipitous; the eastern side slopes down to the sea. The Five Giants are rocks lying off the North-east point.

Landing.—There is no landing on the western side, except in remarkably fine weather, on account of the heavy swell nearly always breaking there. On the eastern side, a landing can be effected at several places, but seldom without difficulty, as the swell sets round the northern and southern sides of the island.

General chart 748a.

Chart of Crozet islands on 802. Var. 30° 50' W.

The best landing is about $2\frac{1}{4}$ miles southward of the Five Giants, on the north-eastern side. To a vessel approaching from the northward, the anchorage is easily recognised as it is off a reddish bare bluff close to the water, the first bluff southward of the North point, and stands at the side of Verdoyant point, which is covered with green grass and moss. The landing place is in Boat cove, a small inlet on the southern side of the bluff, protected from the southern swell by a long wall of black, flat rocks, from 3 to 7 feet above water, running out at a right angle from the shore. Opposite Verdoyant point, with the dépôt hut bearing N.W. by W., there is an isolated flat rock at 200 or 220 yards from the shore.

Anchorage.—The *Comus* anchored in 12 fathoms, good holding-ground, about 5 cables from the shore, and the same distance eastward of the landing place mentioned. In December, 1887, the French vessel of war, *Meurthe*, anchored in 13 fathoms, with the dépôt hut bearing N.W. by W., at $2\frac{1}{2}$ cables from the black rocks and $4\frac{1}{2}$ cables from the landing-place. The *Meurthe* rode out a fresh breeze at single anchor, without dragging. This is said to be a safe anchorage in all prevailing winds, as easterly winds scarcely ever blow hard; several large whalers have laid there in the winter months in safety, though it would be more prudent to get under way on the approach of bad weather. During the three days the *Comus* remained at this anchorage the landing was difficult except on the night of the vessel's arrival. This anchorage is best approached from the northern side of the island.

Depôt.—Provisions for the use of shipwrecked people (50 men for 50 days) were landed from the *Comus* in March, 1880, and a dépôt formed in the substantial hut, before mentioned, near the cove. Benjamin Miller, a sealer, whose services had been engaged at the Cape of Good Hope as pilot for the *Comus*, had formerly lived in this cove, and there were no signs of any people having been there since he left 10 years before. The supply left by the *Comus* had been exhausted by the shipwrecked people of the *Tamaris* previous to the visit of the French vessel *Meurthe*, in December, 1887, on which occasion that vessel stored the hut with a ton of preserved beef, half a ton of biscuit, three-quarters of a hundredweight of sardines in oil, 20 blankets, 15 pairs of shoes, and 15 pairs of cloth trousers; the whole carefully packed in boxes. Also 2 spears, 2 hatchets, and cooking utensils.

The *Tamaris* was wrecked on the Crozets in 1887; 13 mariners, supposed to be French, having exhausted the provisions, left Hog island on the 13th September to go to Possession island, but were never afterwards heard of. The story of the wreck, dated 4th of August, and punctured on a tin collar, was found on the neck of a dead albatross on the beach at North Fremantle, West Australia, on the 18th Sep-

Chart of Crozet islands on 802. Var. 30° 50' W.

tember. The French vessel of war, *Meurthe*, was sent to the islands in December, but found the place deserted, and restored the dépôt as just now stated.

Since the visit of the *Meurthe*, Hog island has been sighted by several vessels, notably the s.s. *Thermopylæ*, in November, 1895, and again by the s.s. *Moravian*, in December, 1901; both vessels reported the dépôt hut to be apparently intact, and no signs whatever of human life, or of recent habitation. The coasts and grassy slopes, however, literally swarmed with the bird and animal life previously mentioned as found on these islands.

When the s.s. *Wakefield* visited this island in March, 1910, the hut was found to be broken down, and all the provisions and clothing absolutely rotten. An ordinary domestic cat was seen on the island, which would point to fairly recent human habitation.

Apostles islands (Lat. 45° 57' S., Long. 50° 20' E.) form a group consisting of two principal islands from one to 1½ miles long, and 10 pinnacle rocks from 50 to 400 feet in height, with a few outlying rocks extending south-westward, with deep water between some of them; the outermost rock, which is awash and breaks heavily, lies about three-quarters of a mile westward to the southernmost Apostle rock. See view on chart.

North-east island, the largest, is a volcanic rock about 850 feet high, and lies 10 miles E.N.E. from Hog island. Its south-eastern coast appears to be clear of danger and steep-to. The *Comus* steamed two or three times up and down it, within half a mile of the rocks, sounding, but obtaining no bottom with 15 fathoms of line. The north-western coast should be approached with caution, as sunken rocks are said to exist in that direction. There are one or two spots where landing can be effected, though with difficulty, when the water is smooth.

The vessel *Strathmore* was wrecked on the Apostles on the 1st July, 1875; the surviving crew and passengers, 44 in number, landed on North-east island, where they remained until rescued by an American whaler on the 21st of January, 1876.

The other island and the ten rocks are formed of basaltic columns or needles.

Penguin island bears S. by W. ¾ W., and is distant about 20 miles from the anchorage off Boat cove, Hog island. It is a barren volcanic rock, about 1,000 feet high and quite inaccessible, the cliffs on the northern and western sides being upright like the walls of a fortress. There is a rock about 250 feet high off its north-eastern point, appearing as if it had been cut off from the island.

A rock on which the sea breaks heavily, lies about 1½ miles S.S.E. from Penguin island.

General chart 748a.

Chart of Crozet islands on 802. Var. 30° 50' W.

Heroine breaker consists of two rocks, about 4 feet above water, which always show breakers. From the anchorage off Boat cove, Hog island, it lies nearly in a line with the western extreme of Penguin island, is nearly midway between these two points, and therefore about $5\frac{1}{2}$ miles southward of the South extreme of Hog island.

POSSESSION ISLAND (*Lat. 46° 24' S., Long. 51° 42' E.*) was so named by Captain Marion de Fresne, who, on January 24th, 1772, took possession of the larger island of the group in the name of the King of France, naming it "Prise de Possession," and a bottle enclosing the act of taking possession was placed upon a pyramid of rocks on the island; it is the largest of the Crozet group, is a perfect mass of volcanic mountain, about 14 miles long and 7 miles wide, attaining in two peaks a height of about 5,000 feet, covered with a considerable quantity of snow, the melting of which keeps the lowlands and valleys perpetually moist, forming in most parts deep bog covered with an emerald green growth. Numerous waterfalls were seen on the island during the visit of the *Challenger* in 1873. The lofty hills of Possession island appear to attract and condense the fog as it passes, so that whilst the weather side of the island is enveloped in mist, the south-eastern, or lee side, is generally free from it. This has been noticed by most voyagers, and is probably the ordinary course of things, for it has also been observed that there are no albatross' nests on the misty portion of the coast, whereas the clear part at the right season is thick with them. The slightest temporary change of wind might, however, cause a similar temporary change in fog conditions.

On March 18th, 1894, the s.s. *Thermopylæ* observed an iceberg, about 250 feet high, apparently aground on the N.W. side of the island, and there were several other smaller bergs in sight. In November of the following year the same vessel coasted close along the coast of the island, and reported that the depôt huts appeared to be intact, and also the usual abundance of bird and animal life noted by other voyagers, but no sign of human life or of recent habitation. This report is again confirmed in all respects by the s.s. *Moravian*, which, in December, 1901, passed close round the North-east, North, and North-west coasts, but not so far round as Ship cove.

Pointe des Moines, the north-western extreme of the island, is so named from the rock off it resembling a Capuchin monk; from that point the coast consists of a continuous line of cliffs for $7\frac{1}{2}$ miles eastward to Dark head, a high sombre headland; from thence it trends southward, the cliffs being still higher, and several cascades may be seen falling over them.

A high, perforated rock, lies about 2 miles off the North coast, westward of Dark head, and there are several rocks near the coast on the south-western side of the island.

General chart 748a.



(a)

Possession island. American bay.



(b)

Possession island. American bay.



Possession island. Ship cove.

Chart of Crozet islands on 802. Var. 30° 50' W.

A breaking patch was reported by the s.s. *Australasian*, in 1886, as lying with the north-western point of the island bearing about N.E. by E., distant from 4 to 6 miles; it is marked on the chart as *position doubtful*. This is the only known danger at any considerable distance from the shore. No indications of shoal water were seen off the N.W. headland by the s.s. *Turakina*, in 1907, but in 1910 the s.s. *Wakefield* observed a breaking patch about 3 miles off-shore and on the bearing of the *Australasian's* breaker as shown on the chart. The rocks near the island are covered by a mass of kelp, even those with 4 or 5 fathoms water over them.

American bay (*Lat. 46° 23' S., Long. 51° 47' E.*), on the north-eastern side of Possession island, about 3½ miles from the south-eastern point and 7 miles from Dark head, is semicircular, recedes 5 cables south-westward, and is 2½ cables wide at the entrance between the weed, where the depth is 13 fathoms; at the centre of the bay are 7 fathoms, and from 4½ to 5 fathoms near the kelp at its head. It is perfectly sheltered from all winds except those from between North and E. by N., and is partly sheltered in the latter direction by kelp extending from its eastern point; close to the kelp there are 6 fathoms. The bay is easily recognised (*see* views, page 472); on the eastern side of the entrance is a remarkable brownish cliff; on the western side is a large mass of dark-coloured rock, having at its base a grey pinnacle rock about 50 feet high; the dépôt huts may be seen when bearing southward of S.W. by S.

The *Comus* anchored outside the bay in 12 fathoms, but after examination, shifted berth into it, anchoring in 5 fathoms, where she found perfectly smooth water, with 4½ fathoms close to the shore at the head of the bay and one fathom at the sides; the eye is the best guide to place the vessel in a central berth. The beach is of black sand, and landing could always be effected here during that vessel's stay. Captain East considered that a vessel of the *Comus* class could lie here in perfect safety; the *Meurthe*, at the time of her visit, found a heavy swell setting in and the landing very difficult. When the wind veers to South-west the bay is liable to sudden gusts which rush down the valley, through which a river flows into it.

Depôt.—A depôt of provisions was formed here for the use of shipwrecked people, sufficient for 50 people for 50 days, also jerseys, trousers, stockings, and shoes. The provisions were landed from the *Comus* without difficulty, and stored in shelter huts in the south-eastern corner of the bay, about 100 yards from the shore. These provisions were still intact when the *Meurthe* visited the island in December, 1887.

General chart 748a.

Chart of Crozet islands on 802. Var. 30° 50' W.

The remains of several huts formerly used by whalers were found in American bay; but these fisheries have been abandoned, and no one had apparently landed for many years. The beaches swarmed with sea-elephants; a few ducks were shot, and guinea-fowl were seen. The Kerguelen cabbage abounds, also an edible plant, named red root, on which it is said life might be sustained.

The s.s. *Turakina* visited this bay in February, 1907, to take off the crew of the schooner *Catarina* wrecked there. She found that the provision dépôt had been blown down, and all the clothes and most of the provisions were rendered useless; most of what were serviceable had been used by the shipwrecked crew, the remains and 5,000 cartridges, but no gun, were left in the hut that had been built by the shipwrecked crew a few yards from the beach and midway between the headlands forming the bay. When the s.s. *Wakefield* visited this island in March, 1910, the store hut was found to be in bad repair, but the provisions appeared to be intact; there were no signs of any clothing, and the hut swarmed with rats. There were several boxes of ammunition. This dépôt was apparently replenished by the Norwegian Government in 1909; the vessel that brought the provisions was the s.s. *Solglimst*, which was afterwards wrecked in the landing cove, Marion island. A little eastward of the S.E. headland is a large tank painted red; this is the most conspicuous mark to be seen in approaching the bay.

Plan of Ship cove on 802.

Ship cove (Lat. 46° 29' S., Long. 51° 49' E.) (see view c, page 472), is at the southern end of Possession island, and is entered between regular slopes covered with very green grass, is about 600 yards in length and 200 yards wide at the entrance, with depths of from 17 to 7 fathoms; its shores are fronted for a distance of about 150 yards by large fields of kelp, and there is a thick layer of kelp right across the entrance. It affords good shelter, with northerly and westerly winds, but with the first signs of an easterly wind vessels should leave; with north-easterly winds it might be preferable to American bay. The French Corvette *Heroine* remained here five weeks, during her examination of the group. The landing was bad when the *Challenger* in 1873, and *Comus* in 1880, were hove-to off the entrance; the former could not approach within half a mile of the entrance on account of the heavy cross swell then prevailing.

Breakers were reported by s.s. *Turakina* in 1907 to exist about half a mile off the S.E. headland.

The *Wolverine* anchored midway between the entrance points, in 17 fathoms, bottom cinders.

General chart 748a.

Plan of Ship cove on 802. Var. 30° 50' W.

The s.s. *Turakina* anchored off the entrance to the cove in 21 fathoms, with the entrance bearing N.W. by N., but did not consider it at all a safe anchorage, as, although the vessel did not attempt to drag, she sheered about in the most alarming manner, and when the anchor was weighed it was polished bright.

Landing.—The *Meurthe* found the landing very easy, but at times a heavy sea rolls in and it then becomes difficult.

Water.—A stream of good water runs into the head of the bay.

Chart of Crozet islands on 802.

EAST ISLAND (Lat. $46^{\circ} 26'$ S., Long. $52^{\circ} 9'$ E.) lies about $9\frac{1}{2}$ miles E.S.E. from Ship cove; it is about 7 miles in diameter, is a splendid mass of perpendicular volcanic mountains, with jagged tops, rising by a succession of cliffs to a height of about 4,000 feet above the sea, and covered with snow. The coasts are steep, and the precipices in some places several hundred feet in height, but there are little bays on the northern and eastern sides, and numerous waterfalls, some of which are of considerable volume, and fall over the cliffs into the sea. There are also slopes and hillocks covered with grass and moss in summer, and the same evidences of bird and animal life as in the other islands of the group. The south-western point terminates with a high rock in the form of a triangular pyramid; the side facing the sea has an absolutely smooth and polished appearance. On the southern side of the island are high red cliffs and broad streams of lava. Three high rocks, about 2 miles apart, lie from one to 3 cables off the southern coast; one is 50 feet high, another has the appearance of a boat under sail. The sea breaks furiously on every part of the western and southern sides.

Anchorage.—East island offers temporary anchorage in from 13 to 15 fathoms on its northern and north-eastern sides, which, from the appearance of the vegetation growing close to the water's edge, can seldom be washed by heavy seas. Kelp was seen off the eastern point of East island and its detached rocks; there is no beach whatever.

Depôt.—A depôt of provisions for shipwrecked people was established in a sheltered position at the eastern end of this island by the *Comus* in 1880, and was visited and replenished in 1887 by the *Meurthe*, the hut being then in good order. Captain Simpson of the *Moravian* passed close to the island in December, 1901, and observed

General chart 748a.

Chart of Crozet islands on 802. Var. 30° 50' W.

an iron tank on the beach in the most eastern bay of the North coast ; and, on the western and most sheltered side of the bay, apparently the remains of a hut with several casks close by. Near the beach, where landing would appear to be easiest, was a post erected on a cairn built of stones, apparently to attract attention, but no signs of recent habitation were visible. Ruined huts of whalers were standing 30 years ago in North-east bay, probably the same bay as that referred to by Captain Simpson, but they can scarcely be the remains he saw. The erection of the cairn rather points to the probability of the depôt having been visited and made use of since last stored by the *Meurthe*. In 1910, when the s.s. *Wakefield* visited the island, there were still the remains of a hut to be seen in N.E. bay, but no signs of a post or cairn.

Currents.—During several days previous to her arrival at Crozet islands from the Cape of Good Hope in February, the *Comus* experienced currents setting northward and north-eastward 18 miles a day. Between the Crozets and Kerguelen the same current may be expected, but from 120 to 150 miles further north the set is easterly. Near the Crozet islands, close in-shore (especially after heavy gales, which are frequent even in summer), the current runs as much as 2 knots eastward and north-eastward during the flood tide, and southward and south-eastward during the ebb. The *Meurthe* experienced a southerly current in December, 1887.

The winds during this time were from various directions, but had no great force. With north-westerly winds, violent gusts are experienced to leeward of the island.

Iceberg.—An iceberg, $1\frac{1}{2}$ miles in length, and 300 feet high, was seen in December by the *Wolverine* eastward of the Crozets.

General caution.—In the event of shipwreck in the vicinity of the Crozet islands, the boats should immediately make either for the eastern side of Hog or Possession island, or for the northern side of East island, where they may find landing and probably food.

Chart 2398, Kerguelen island. Var. 36° 30' W.

KERGUELEN ISLAND.*—GENERAL REMARKS.

—The island of Kerguelen, including all outlying dangers, lies

*The description of the island is chiefly from the "Narrative of the cruise of H.M.S. *Challenger*," vol. 1, first part; also from the remark books of Captain Fairfax, H.M.S. *Volage*, and the surveys and remarks made by the officers of the German vessel of war *Gazelle*, which vessels accompanied the transit of Venus expedition of 1874, and lastly by M. Henri Bossière in La Géographie, 1908, 1909, and Commander Theodore Ring, Norwegian R.N.R., in s.s. *Jeanne D'Arc*, 1909-1911.

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

between the parallels of 48° 27' and 50° 0' S., and the meridians of 68° 30' and 70° 35' E. The main island is about 70 miles in length, and the same in breadth, with some 15 peninsulas on its eastern side, and others less known on its western side, forming many secure anchorages; but in many parts the dividing isthmuses between creeks and harbours are so narrow as to have received from the sealers the name of *haulover*, from the practice they had of hauling their boats over any narrow isthmus from one harbour or sound to another.

The island for many years was a great whaling and sealing station, reaching the zenith of its importance about 1843, but after that declining until, in 1893, it was quite abandoned. In 1893 the island was leased by the French Government for a term of 50 years to MM. Bossière, who, in 1908, commenced the breeding of sheep, pigs, and horses, and who have also associated themselves with a Norwegian company for the purpose of whale fishing and sea-elephant hunting. The head-quarters of the company are at Port Jeanne D'Arc, inside Long island, Royal sound.

Kerguelen was discovered by the Chevalier Yves Joseph de Kerguelen-Tremerec, who commanded the French frigate *Fortune*, on 12th February, 1772. He thought he had discovered the great Australian continent, and hurried back to France. The next year he was dispatched with two other vessels, the *Gros Ventre* and *Oiseau*, to explore the continent and take possession. He reached Kerguelen again on 14th December, 1773, and although he remained over a month in the vicinity he never landed, but a boat from *L'Oiseau* succeeded in reaching the shore and deposited a bottle with a paper in it taking possession in the name of the King of France; this bay was named after the vessel, but received the name of Christmas harbour from Captain Cook, who discovered it on that date two years later, and who also found the French bottle. The other vessel, *Gros Ventre*, anchored in a bay on the south-west coast, which is called after her, and also has the name of Lion Marin. On his return to France, Kerguelen had to acknowledge his mistake, and was thrown into prison, from whence he gave the name of his discovery *Terre Désolation*.

Captain Cook, on his celebrated third voyage, made the island on the 24th December, 1776, and on the 25th anchored in Christmas harbour. On the 29th December, after watering and cutting grass for his cattle, Cook left Christmas harbour, and, having examined some portions of the eastern and southern sides of the island, giving the names to Royal sound, Prince of Wales foreland, Charlotte point, &c., he bore up for Tasmania.

General chart 148a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

From 1776 until about 1873, Kerguelen was frequented by whaling and sealing vessels, whose captains in the pursuit of their calling had, during that period, roughly explored its coasts, and anchored in most of its numerous harbours. In 1843, it is said there were no less than 500 or 600 whale vessels employed on these coasts or in the immediate neighbourhood; and parties of sealers used to remain on the island for periods of three years at a time. These vessels were generally strongly built and of from 300 to 400 tons; they usually took with them, in pieces, one or two cutters of about 40 tons, which they put together on reaching a secure harbour. The cutters kept up communication with the parties which were detached from their vessels for months together, supplying them with necessaries and collecting the produce. These small cutters frequently circumnavigated the group, and doubtless their crews experienced many anxious moments, especially when on the windward side.

Though the harbours of this remote island were thus well known to whaling and sealing vessels, no accurate information was obtained from the time of Cook's visit until 1840, when Sir James Ross touched at Christmas harbour to obtain magnetic observations; and, during his stay, from May 12th to July 20th, explored the inlets between that harbour and Howe island, whilst Dr. MacCormick investigated the geology, and Sir Joseph Hooker the botany.

From 1840 until the *Challenger's* visit in 1873, made to select suitable sites for the observation of the transit of Venus, no additional information was obtained. The south-eastern part, from Hillsborough bay entrance to Cape Challenger, was surveyed by the *Challenger*, and Ross's work connected with it. Since then, the German frigate *Gazelle*, which attended the Transit of Venus Expedition, has surveyed the coast between Howe Island and Hillsborough bay, thus completing the leeward side, and the *Volage* has added to the knowledge of the southern coast; but the western or windward side is still imperfectly explored, and is at present delineated on the charts from rough sketches by captains of whaling vessels and others.

Much valuable information of the southern and western coasts and a rough sketch has been obtained from Commander Theodore Ring, of Norwegian R.N.R., who made many expeditions along these coasts, 1909-11, when in command of s.s. *Jeanne D'Arc*.

The interior has been but little visited, as, owing to the rugged and boggy nature of the ground, into which the traveller frequently sinks knee-deep, the severity of the climate, the absence of trees and wood, and the want of supplies, all necessaries have to be carried by exploring parties; the difficulties are thus so great that a distance of 10 miles in Kerguelen is fully equal to 30 miles on ordinary ground.

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

M. Bossière says: "The interior of the island has plateaus of bare rock, and in the lakes no fish and no life. These lakes flow into the valleys by numerous and mighty waterfalls, some of them over 2,000 feet high, whose power might be easily utilised. There are no trees, but over very large expanses a plant called *Acaena*, of the genus *Pimpernel*, flourishes, is very useful as fodder for animals, and its roots for fuel; it grows in vast fields, its height in some places reaching 2 feet. Another plant, the *Azorella* selago, grows in large thick tufts, 2½ feet high, but the rabbits are very destructive to it, burrowing in its roots."

Aspect, Mountains, &c.—The island is mountainous throughout, made up of a series of steep-sided valleys, separated by ridges and mountain masses, which rise to considerable heights. Mount Ross (Snowy peak), the highest, is in the south-western part of the island, and rises 6,120 feet above the sea; and Mount Richards, about 46 miles northward of it, from each side of which a glacier descends to the sea, 4,000 feet. In the south-eastern part, within a radius of 10 or 12 miles, are Mount Crozier, 3,250 feet; Mount Hooker, 2,600 feet; and Mount Moseley, 2,400 feet, besides many others of less height. Whilst in the southern part westward of Royal sound are Mount Wyville Thomson, 3,160 feet, surrounded by several peaks of 2,000 feet and upwards within a radius of 5 miles from it; and only 3 and 6 miles respectively northward from Cape Challenger, and at from 1½ to 3 miles inland, are Mount Tizard, 2,700 feet; Mount Evans, 2,600 feet, and others of nearly equal height farther inland.

Mount Havergal, 1,430 feet high, near the North extreme of the island, is remarkable from the north-eastward; it is a huge and imposing mass of black-looking rock, resembling a human head, with perpendicular faces and towering above the high cliffs of Christmas harbour. Chimney top, 2,400 feet high, close to Mount Hooker, in the south-eastern part of the island, is apparently a basaltic mass on one of the Crozier ranges; Mount Campbell, only 460 feet high, on the eastern part of the same peninsula, is a remarkable hill within one mile of the sea, in shape somewhat of a truncated cone, standing alone in a low marshy plain of considerable extent, it forms a good landmark, and once seen can never be mistaken. Mount Peeper, 5½ miles inland and 650 feet high, and Mount Bungay, 2 miles inland and 220 feet high, both rising from the same low marshy plain, are also conspicuous from the eastward; these comparatively low hills are often visible when the higher ranges are enveloped in fog.

When viewed from the sea at a distance, the island thus presents a remarkable jagged outline of sharp peaks, which is most striking when observed from the southward. The valleys slope everywhere

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

to the sea, widening out as they approach it, and the whole coast is broken up by deep sounds or fiords, bounded on either hand by perpendicular cliffs, closely resembling the fiords of Norway and other parts of the world. One fiord on the western side of Royal sound penetrates about 11 miles inland.

The whole island is deeply indented by lakes and inlets, and its surface intersected by numerous small lakes and watercourses. These becoming swollen by heavy rains, which alternate with frost and snow, rush down the sides of the mountains and along the ravines in impetuous torrents, forming in many places beautiful foaming cascades, wearing away the rocks, and strewing the valleys below with vast fragments, and the slopes with rich alluvium, the result of their decomposition. The quantities of fragments accumulated at the base of the hills, in many places to the height of 200 or 300 feet and upwards, afford strong evidence of the rapid disintegration which this island is undergoing from atmospheric causes.

On the western side of the island, some 13 miles north-eastward of Cape Bourbon, and but little removed from the sea coast, there is a volcano, but it is not at present active, while Mineral pitch has been met with, and petroleum and hot springs found by the sealers in several places.

Glaciers.—The summit of the Kerguelen watershed is perpetually snow clad, and from it glaciers descend on each side, occasionally reaching the sea. Mount Richards glacier descends into two deep narrow gorges, one in Bear-up bay, the other near the western entrance to Tucker strait. Cooks glacier is an enormous one, separated from Mount Richards, but apparently being continuous to Snowy peak near Cape Bourbon; this glacier falls into Thunder bay on the west coast, giving it its name from the noise of the huge masses of ice falling. Lindenberg, Zeye and Naumann glaciers are apparently part of Cooks glacier. Owing to the almost perpetual cloud and mist covering the snowclad summits of the main ridge, the glaciers are seldom visible. Those on the eastern side show distinct marks of receding from the coast; the Lindenberg, 4 miles westward of the head of Whale bay, ends in a steep wall of ice, 70 feet high; at its foot, partly underlying it, is a small lake supplying a rapid brook discharging into Emperor basin. Zeye and Naumann glaciers are southward of the Lindenberg, the Naumann terminating about 5 miles westward of the head of Irish bay. No glaciers exist north of Cumberland bay.

Bank of soundings.—The island appears to be the upper portion of a submerged plain of considerable extent, for Sir James Ross found depths of from 70 to 80 fathoms extending 100 miles

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

north-eastward of Cape Digby, and of from 150 to 350 fathoms between its south coast and Heard island; whilst the German frigate *Gazelle* found from 145 to 210 fathoms 100 miles north-westward of Bligh's cap, and 200 fathoms 60 miles northward, and 115 fathoms 70 miles north-eastward from the same island. It is therefore probable that Heard island is the southern peak of the backbone of this submerged plain, for a reference to the chart shows that the main watershed of Kerguelen, of which the culminating point is Mount Ross, extends in a N.W. by N. and S.E. by S. (true) direction; and as the summit of Heard island lies 260 miles S.E. by S. (true) from Mount Ross, and comparatively shallow water has been found between them, it may be concluded that they belong to the same mountain system, although the greater part of the range is submerged.

Wind and weather.—The weather at Kerguelen is cold and boisterous, the prevailing wind being from N.W. to W.N.W. at all seasons, with an average force of 5 or 6. This wind is often deflected on the lee side by the steep valleys and fiords which intersect the island, usually taking the direction of a valley, which acts as a funnel, and descending in heavy gusts or whirlwinds, raising large sheets of foam. So violent are these gusts in Christmas harbour, that Sir James Ross was frequently obliged to throw himself on the ground to prevent being blown into the water; and vessels, moored at the head of the harbour, were sometimes laid over on their beam ends. The sheet anchor had always to be kept in readiness. This account of Christmas harbour is fully corroborated by Captain Lieutard of the French despatch transport *Eure*, who stayed here eight days in 1893. It also applies in a greater or less degree to all harbours having low hills or valleys north-westward of the anchorage.

M. Bossière says: "The wind at frequent intervals blows with great violence, but it is more terrifying than dangerous. It is an error to seek shelter at the foot of the mountains. The wind falls there like a veritable cascade, and the sea is ground into powder."

The westerly wind on striking the island is divided, curving round both the northern and southern extremes, so that on the lee side the wind has a northerly tendency northward of Mount Campbell, and a southerly tendency southward of that peak; thus, vessels proceeding from Royal sound towards Christmas harbour with a south-westerly wind will probably meet with a N.N.W. wind off Cape Digby, and vice-versâ.

During the continuance of the N.W. wind, the weather is squally with passing showers of rain or snow, the sky cloudy, but not so as to entirely hide the sun, and the tops of the hills are frequently cloud-capped.

On the western or weather side of the island, the air, saturated

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

with moisture, impinging on the steep mountain ranges, causes frequent showers of snow, hail, or rain, and the clouds arrested by the hills, accumulate and descend, causing mists and fogs; whilst, as is usually the case, on the leeward side, the air is generally dry, and there is but little fog.

The prevailing westerly wind is sometimes interrupted by north-easterly and northerly winds, which blow with considerable force, and during their continuance the sky is overcast and the weather thick and rainy; they usually follow a high barometer and fine weather. Just before they commence, the barometer falls rapidly and the thermometer rises, and their duration is inversely as the rate of descent of the barometer. On one occasion in Betsy cove, the *Challenger* experienced a sudden north-easterly gale which only lasted three hours, the barometer falling a tenth of an inch per hour for four hours. These winds are called by the whalers "northers," and their liability to blow at all seasons should be borne in mind in selecting an anchorage, for inlets such as Cascade reach and Accessible bay are open to these winds; Betsy cove is, however, protected from them. It must be remembered that strong winds are the rule, and moderate or light breezes the exception, and that though clear weather prevails immediately to leeward of the group, the land is not extensive enough to cause much alteration in the general condition of the atmosphere hereabouts, which is thick and foggy. During the 68 days Ross spent in Christmas harbour in the depth of winter, it blew a gale on 45 days, and only three days were entirely free from snow and rain. In the 26 days spent here by the *Challenger*, in January, strong breezes or gales prevailed for 16 days; and whilst the *Volage* was at the island from the 9th October to the 27th February, seven gales were registered in October, 14 in November, 16 in December, 10 in January, and 12 in February.

From an investigation made by the Meteorological Office of 118 days' observations in December, spread over a period of many years, it would seem that many of the gales mentioned may have been caused by the nature of the ground surrounding the anchorages, as at sea between the Crozets and Heard island, there are on an average five clear days, 11 fine, and 15 overcast. Fog or mist occur on seven days; rain, snow, or hail on nine days; and four days are stormy. Occasionally, but very rarely, the usually boisterous weather is interrupted by a calm or a light easterly wind, when the sky is perfectly free from cloud and the atmosphere is remarkably clear, every hilltop being distinctly visible; this seldom lasts 24 hours, and is generally succeeded by a gale.

At Saddle or West island, during a period of 43 days in October and November, 1910, snow or rain fell on 33 days, and 6 days were fine;

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

14 gales were registered, 10 days very strong wind, 7 days fresh breezes, and 12 days of light wind. The weather at Port Jeanne D'Arc during this same period was slightly better, as snow or rain fell on 29 days and 8 days were fine, the wind also was not so strong as at Saddle island.

The following information is from the master of a whaling steamer who has had considerable experience of these regions: "With the wind south of west, or west, and with snow, fine weather may be expected, especially if the glass is steady, no matter what height the mercury may be. With the wind north of west and an unsteady barometer, rain, fog, and heavy weather may be expected, the worst blow always coming from N.W. A strong gale has never been known to last more than 24 hours; if a gale commences at daylight it may be expected to moderate at sundown and vice versâ. After a calm the weather may be foretold for about four days in the same manner from the direction the wind first springs up in and the steadiness or otherwise of the barometer."

The mean pressure of the barometer is about 29·35, and the extreme range from 30·30 to 28·40. *See also* Meteorological table, Appendix I.

The climate is much the same throughout the year, the mean summer temperature being about 45°, and the mean winter 29°; the maximum summer being 68° and the minimum winter 24°. Although the thermometer, even in the depth of winter seldom falls below freezing point, and the snow seldom remains on the low ground more than a few days at a time, a heavy fall is no uncommon occurrence at all times of the year. December is said to be the finest month. In spite of cold, wind, and rain, the island is very healthy, the most general complaint being an excess of appetite.

Currents.—Between the Crozet islands and Kerguelen there is generally a northerly and north-easterly set of the current at a rate of about half a knot an hour. At a distance of from 120 to 150 miles further north the set is easterly. The current immediately round Kerguelen and the off-lying islands is generally affected by the wind or the after-effect of the wind, but the tidal streams are appreciably felt in places sometimes running strongly against the wind.

Kelp weed.—Caution.—Large patches of loose kelp are met with in the neighbourhood of Kerguelen, but this is easily distinguished from that attached to rocks by its heaped-up and confused appearance. Thick patches of growing kelp should always be avoided, as dangers are almost sure to exist under them. When kelp grows in long thin streamers deep water, as much as 30 fathoms, may be found under it, but great caution is necessary as, in exposed places, especially off the southern and western coasts, shoal water has been found under

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

thin kelp. Many entrances to bays and harbours are obstructed by kelp, with narrow lanes of deep water, requiring considerable caution to keep it clear of the propellers of vessels entering or leaving.

Icebergs, some of them large and very dangerous, are occasionally seen in the neighbourhood of Kerguelen and the other islands in about the same latitude. In 1897 one was seen 90 miles northward of Kerguelen, said to be 5 miles in length. For further information on Ice, *see* page 19.

Industries.—The whale fishing, which was re-started in 1909, promises great success, as in the first season 232 whales were captured, all valuable in commerce, and it is hoped to increase this number largely in the future. The sea-elephants, who have returned and are now plentiful on the island, have valuable skins and blubber, and the hunting of them is likely to prove as valuable an industry as the fishing.

Sheep and pig rearing also promises well, and it is hoped to raise cattle and horses. All the animals eat and thrive apparently on the Acaena plant. Small repairs to vessels may be effected at the factory, Port Jeanne D'Arc.

Supplies.—Ducks, penguins, and many varieties of sea birds are abundant, and their eggs may be obtained in quantities chiefly in November and December. Rabbits are numerous; the only other animals on the island, besides those introduced, are rats and mice, which abound. The Kerguelen cabbage, which is an excellent anti-scorbutic, is only found in abundance where there are no rabbits.

Coal of very inferior quality is found at the Arch rock in Christmas harbour, some 30 feet above the sea; combustible coal is said to have been found by sealers in one of the southern coves of Breakwater bay, Coal is marked on the chart as existing in the southern shore of Cumberland bay, adjoining Breakwater bay; also at the head of Cumberland bay. Numerous seams, varying in thickness from a few inches to 4 feet, were found by Ross's expedition embedded in the trap rock, near Centre bay. There is a seam of coal in Sandy cove, Foundry branch, of a fairly decent quality, and a seam of bad coal in the mountains behind the Settlement, Port Jeanne D'Arc.

The coal at Cumberland bay is reported by M. Bossière to be of good quality and as burning well in stoves and steam-vessels' furnaces.

Landfall.—**Bligh's cap** (Ile du Rendezvous) (*Lat. 48° 27' S., Long. 68° 47' E.*), 230 feet high, is a round inaccessible rock, from which Cape François, at the entrance to Christmas harbour, bears S. $\frac{1}{4}$ E., distant $16\frac{1}{2}$ miles. From its position, off the North extreme of the island, with no known dangers in its vicinity, vessels visiting Kerguelen are recommended to make it, from whence they can shape course, generally with a fair wind, to the intended anchorage.

General chart 748a.

CHRISTMAS HARBOUR.

Chart 2398, Kerguelen island. Var. 36° 30' W.

Bank.—In March, 1910, the steam whaler *Mangoro* reported striking a bank, with a least depth of 12 fathoms over it, about 20 or 25 miles N.N.W. of Bligh's cap. The position is very doubtful, as the bank was struck in a fog, no observations had been obtained for several days, and the deviation of the vessel's compass was found to have changed very much.

Cloudy islands, so named by Cook, are a group lying from $6\frac{1}{2}$ to 12 miles south-westward of Bligh's cap. Roland, the north-eastern island, is 1,700 feet in height, and about 2 miles in diameter.

Croy island, the other large island of the group, is 1,600 feet high, and lies about 4 miles westward of Roland island; between the two islands are numerous small islands and rocks. A cove with anchorage for small vessels exists on the S.E. side of both Roland and Croy islands. About 12 miles S.W. by W. from the peak of Roland island and about 5 miles northward of Cape d'Aiguillon is Clugny, an island about one mile in extent and 290 feet high; it has a small rock off its southern point. A reef exists about midway between Clugny island and the south extreme of Roland island; except for this the channel between the off-lying islands and the mainland is apparently quite clear, as the *Jeanne D'Arc* passed through during heavy weather, and saw no breakers.

Plan of Christmas harbour on 800.

CHRISTMAS HARBOUR (Baie de l'Oiseau)

(*Lat. 48° 40' S., Long. 69° 3' E.*), at the northern extreme of Kerguelen island, and facing eastward, is nearly one mile wide in the entrance between Cape François, a perpendicular rock of considerable height, on the North, and Arch point on the South; the latter terminates in a rock 150 feet high, which formerly was perforated and resembled the arch of a bridge, but now the arch has fallen in. Mount Havergal, towering over the harbour to the westward, as described at page 479, is also a conspicuous mark. The harbour or inlet recedes about $1\frac{3}{4}$ miles in a north-westerly direction. Just within Arch point is a small bay that somewhat increases the breadth of the inlet for nearly half the distance, when it suddenly contracts to about $3\frac{1}{2}$ cables, and then gradually diminishes to its head, terminating in a level beach of fine dark sand, which extends quite across, a distance of about 400 yards. On this beach were erected Sir J. C. Ross's astronomic and magnetic observatories.

The shores on either side of the harbour are steep, and rise in a succession of terraces to a height of more than 1,000 feet. The highest hill, which is on the northern side, attains a height of 1,215 feet; from its apparent form it has received the name of Table mount. The summit is, however, a very distinctly-formed oval-shaped crater about 100 feet across.

General chart 748a.

Plan of Christmas harbour on 800. Var. 36° 20' W.

The French flag was hoisted at Christmas harbour on January 2nd, 1893, by the French war vessel *Eure*.

Anchorage.—The portion of the harbour available as an anchorage is about one mile in length, with depths of from 6 to 15 fathoms, fine dark sand everywhere except near the shore, where, in some places, are rocks covered with kelp. The head of the harbour is open to two points of the compass, viz., from S.E. to E.S.E., and even these are partly covered by islets in the offing, so that little or no sea can reach the anchorage. A good berth is in 9 fathoms, about 3 cables from the head of the harbour. Good ground tackle is required, as the squalls from the north-westward rush down the valley at the head of the harbour with tremendous violence. Ross remained in this harbour for a period of 68 days, and experienced the weather described at page 482. The French ship *Eure* described it as anything but a pleasant or even safe anchorage, on account of the sudden changes of weather and tremendous squalls to which it is liable.

Tides.—It is high water, full and change, at Christmas harbour, at 2h. 0m.; springs rise 2 feet (approx.).

The flood stream sets north-westward off Christmas harbour.

Chart 2398, Kerguelen island.

Foul Hawse and **Muscle bays** lie between Christmas harbour and Cumberland bay; there is a good safe anchorage at the head of Foul Hawse bay, no bottom at 8 fathoms being obtained up to the head, but the kelp should be avoided. There is also good anchorage at the head of Muscle bay, but easterly winds raise a considerable swell in both bays.

Cumberland bay (*Lat. 48° 47' S., Long. 69° 0' E.*).—Cape Cumberland, the northern point of entrance to Cumberland bay, is about 4 miles southward of Christmas harbour. Off Cape Cumberland is a small island, 185 feet in height, and on its summit is a rock like a sentry box, from which the island takes its name. A rocky patch, marked by kelp, lies midway in the entrance to the bay, southward of Cape Cumberland, with kelp between it and the Sentry Box; the channel lies southward of this patch. At 2 miles eastward of Cape Cumberland are Davis islets, with rocks and broken ground about them. Captain Cook, in the *Resolution*, sailed between these and Sentry Box island, the channel being a full mile wide and at least 21 fathoms deep.

Cumberland bay extends about W. $\frac{1}{2}$ S. 12 miles to its head, and is about one mile wide. The head of the bay terminates in a creek about $2\frac{1}{2}$ miles long, taking a south-westerly direction, and having depths of from 3 to 4 fathoms, it is separated from the West coast

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 20' W.

of Kerguelen by a swampy isthmus 3 miles wide and of moderate height. At 2 miles from the head of the creek is a lake $1\frac{1}{2}$ miles long and nearly half a mile wide, filling up that which would otherwise have been a pass through the mountains, which latter rise above it to a height of 2,500 feet. On the isthmus, several loose pieces of coal have been found.

The anchorages in Cumberland bay are much better than those of Christmas harbour, and are not exposed to such violent winds; they are, however, not so easy of access, and could only be entered by a sailing vessel in moderate weather. There are two inlets in Cumberland bay, one on either side, about 7 miles from the entrance; that on the northern side is about three-quarters of a mile long, and has a depth of 6 fathoms; that on the southern side is rather larger, and has from 6 to 7 fathoms. Cumberland bay has not been sounded.

Breakwater bay, the next southward of Cumberland bay, lies at the inner part of an inlet formed between Lucky point and the adjacent land to the westward. The bay is about one mile wide at the entrance and recedes about 5 cables, with soundings of from 7 to 11 fathoms. The south-eastern corner is full of kelp. At the head of the bay is a cove into which a lake empties itself. A better description of coal is found here than at Christmas harbour.

WHITE BAY, south-westward of Breakwater bay, is extensive, and contains several good harbours, as presently described. It received its name from several white spots of land or rocks at its head. Off Cox point, the southern entrance point of the bay, are several rocks awash. Cox point is reported to be 2 miles further South than is shown on chart.

Loom bay, on the western side and well within the entrance of White bay, is about one mile in extent, with a depth of 10 fathoms. Seal bay, separated from Loom bay by a narrow neck of land, is about one mile long and 5 cables wide, with from 7 to 10 fathoms. Kelp extends about $1\frac{1}{2}$ cables from the western point of Loom bay and a sandy spit about the same distance, but the eastern shore is clean; at the head is a sandy beach and a waterfall.

Centre bay (*Lat. 48° 56' S., Long. 69° 2' E.*) is the western head of White bay; its shores are less bold as the head is approached, but are surrounded by higher cliffy hills. At its head is a remarkable red cliff, from whence, beyond a narrow opening, the shores trend westward about half a mile, terminating in low sandy spits coursed by rivulets.

Coal was discovered here by exploring parties from the *Erebus* and *Terror*. Devil's punch-bowl, at the entrance of the bay, is a deep

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

ravine enclosed on three sides by hills about 1,500 feet high, from which gusts of wind come down with terrific force.

Bear-up bay, south-westward of White bay, and with a direct passage into it from that bay, runs in about 7 miles; it is said by sealers to afford good anchorage. Mount Richards towers above the South shore of this bay, and a glacier discharges into a narrow gully on the south side. This bay is connected with Africa bay on the west coast by a gorge about 5 miles long that was traversed by Commander Ring.

London river is a narrow arm of the sea separated from White-bay by an island 11 miles in length and scarcely 2 miles wide, of which the summit is Mount McCormick. The southern side of the so-called river is formed by Prince Adalbert island, westward and southward of which London river communicates with Rhodes bay by a passage known as Tucker strait. The eastern part of this strait was examined by the *Gazelle*, but, not liking its appearance, she returned to Rhodes bay. There is probably a good passage through it, avoiding the kelp; though that vessel found a rock in it unmarked by kelp, which is very unusual.

Swain islands, of which the two principal are Castries and Dauphine islands, lie in the approach to the inlets between Cumberland and Rhodes bays, and about 8 miles off Howe island. The largest island, Castries, is 380 feet in height. Seals were formerly plentiful about these islands, but there is no anchorage.

Glass rocks are a chain of black islets, only 6 feet high, and lying S. by E. $\frac{1}{2}$ E. distant 7 miles from the southern extreme of Castries island. From their colour they stand out clearly and may generally be seen from a considerable distance even in misty weather.

Terror reef breaks heavily; it is charted about 2 miles north-eastward of Castries island, but its position, as well as another patch of breakers and foul ground which extends about 4 miles seaward of a line joining Castries island and the Glass rocks, has not been accurately determined. Vessels should give this locality a wide berth, or pass westward of the Swain islands and Glass rocks.

Howe island (*Lat. 48° 51' S., Long. 69° 26' E.*), named Howe Foreland by Cook who supposed it to be a peninsula, is 4 miles in length, and 760 feet high at Yule bluff, its north-western extreme. The island has many sandy beaches between projecting rocky points. Rocks and breakers are said to extend off its northern extreme, whilst Allen rock and Dayman islands, the latter 104 feet high, both apparently steep-to, lie $1\frac{1}{2}$ miles from its eastern coast.

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

RHODES BAY lies southward of Howe island, and between Prince Adalbert island and Bismarck peninsula; it is about 13 miles in length by 2 or 3 miles in breadth, and contains several good anchorages. Its entrance is quite safe and clear of weed, though the approach from the southward, westward of the Bird rock, is obstructed by the extensive fields of kelp passed through by Cook in the *Resolution*, which may cover shallow patches. Spry rock, awash, on the northern side of the entrance, lies $1\frac{1}{2}$ miles south-eastward of Oakeley point, Howe island. Wood rocks, most of which appear to be above water, lie about the same distance north-westward of Sibbald island, on the southern side of the entrance. Coming from the eastward, the safe entrance is between the Glass rocks and Bird rock, $5\frac{1}{2}$ miles apart in a North and South direction. The *Eure* obtained soundings of 11, 17, and 19 fathoms and found some kelp eastward of the Bird rock. Bird rock has deep water all round, and may be safely passed at a distance of 2 cables; breakers have been observed in the kelp eastward of the rock.

Mary harbour, on the north-western side of Rhodes bay, lies N.W. and S.E., and is $1\frac{1}{2}$ miles in length by 5 cables in breadth, with from 7 to 10 fathoms, soft mud and not good holding-ground. It is surrounded by hills ranging from 600 to 1,200 feet in height, from which, during gales, heavy squalls descend first from one direction and then from another. The *Eure* dragged with three anchors down and six times the length of cable, compared with depth of water, though using steam to relieve the anchors. There is a beach of black and yellow sand at the head of the bay and a good stream of fresh water in its northern corner.

In rainy weather many beautiful waterfalls pour down the slopes of the mountains into the harbour; the deposit from these cascades renders the upper part of the harbour unfit for anchorage. The best berth is in the centre in about 6 or 7 fathoms; farther in the water shoals rapidly to $2\frac{1}{2}$ fathoms. To enter the harbour and to ensure avoiding a 4-fathoms patch amongst the kelp, deep-draught vessels must keep close to the north-eastern point of entrance and along that shore, carefully steering through the kelp where it is least thick, where depths of 7 or 8 fathoms will be found. Kelp extends from the two islets on the south-western side right across the channel; there are no other dangers.

Credner harbour (*Lat. 49° 1' S., Long. 69° 20' E.*), 2 miles south-westward of Mary harbour, is adapted for small vessels and has this advantage, that vessels can generally enter and leave it with a leading wind, which is not the case with Mary harbour. The anchorage is in 10 fathoms, but the space is somewhat limited; near

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

its head are patches of 3 fathoms. The entrance is along the coast of Adalbert island, north-westward of the small island fronting the anchorage. The passage southward of that island abreast of its western extreme is obstructed by rocks and kelp.

Helen harbour, southward of Credner harbour, is about $1\frac{3}{4}$ miles in length, and easy of access, with good anchorage near its centre in about 14 fathoms. It is partly surrounded by hills from 400 to 600 feet in height; these are somewhat low to the westward, which probably subjects the anchorage to heavy squalls from the prevailing westerly winds, requiring a good scope of cable.

Tucker strait has previously been referred to under London river; all the information possessed is shown on the chart.

Weinick bay lies on the eastern shore of Rhodes bay, and is partially sheltered from northerly winds by Bethel island, which is reported to be incorrectly drawn on the chart; another island, about 100 feet high, is said to lie in the entrance. There is safe anchorage in the bay.

Aldrich channel leads from the anchorages in Rhodes bay to Christmas or other harbours to the northward, and is free from danger. It separates Prince Adalbert island from McMurdo and Howe islands. The *Challenger* used this channel by picking her way through lanes in the kelp weed, and found nothing less than 23 fathoms; the clear channel passes close to the eastern extreme of Prince Adalbert island; from thence about one mile northward of Breakers bluff. Off Breakers bluff there is a flat islet and a rock awash.

Fullers harbour, named after the Master of the *Roswell King* whaling schooner, lies close under Howe island and westward of Hallett islands. It affords secure anchorage from the prevailing wind in 15 fathoms or less. The *Challenger* anchored here.

Bismarck peninsula separates Rhodes and Whale bays. It is triangular in form, its sides being about 12 miles in length; Mount Palliser, its north-eastern extreme, is 720 feet in height and tabular in appearance from some directions; near where the peninsula joins Kerguelen island is a mountain 1,196 feet in height, with a gradual slope to the low and narrow neck less than half a mile wide, which connects the peninsula with the island, in the southern bight of which peninsula is Jeschke harbour, presently described. Several smaller peninsulas extend from the eastern side of Bismarck peninsula, in an easterly direction, and between them there are many good harbours, with Gazelle strait leading to them from the northward.

Gazelle strait (*Lat. 48° 55' S., Long. 69° 35' E.*) is the narrow passage between the Kay rocks, off the North extreme of Bismarck

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 40' W.

peninsula on the one side, and Wood rocks, Sibbald, and Seal islands on the other. The *Gazelle* passed through this strait in not less than 14 fathoms, by picking her way through the kelp, which almost blocks the passage between Kay and Wood rocks. A breaking patch lies northward of Kay rocks.

Breakers have been observed about 2 to 3 miles eastward and 4 to 5 miles eastward and south-eastward of Seal island. Breakers have also been observed from one to 2 miles off Cape Francis. Great care is necessary when navigating along the land between Sibbald island and Henry island, and all kelp should, if possible, be avoided.

Sunday harbour, close southward of Mount Palliser, is about 3 miles in length East and West, by about 5 cables in width. The eastern part of the harbour is rather deep, and the best anchorage is in from 6 to 12 fathoms within 5 cables of the head. Here the hills are low, which subjects the anchorage to heavy westerly squalls; and as sailing vessels had to beat up to the anchorage, it has never been much used. Erfolg harbour, a small but easily accessible creek on the northern side of Sunday harbour, near the entrance, offered safe and much better anchorage for whaling craft, with depths of from 5 to 7 fathoms, and was consequently much frequented.

There is also a snug little harbour, with a depth of 4 fathoms, about mid-way between Sunday harbour and Cape Neumayer, to the northward.

Palliser road (*Lat. 49° 0' S., Long. 69° 38' E.*), southward of Sunday harbour, and about 1½ miles south-westward of Wittstein point, was Cook's first anchorage. It affords shelter from the prevailing westerly wind in from 7 to 9 fathoms, but the bank is rather steep; it may be entered from the northward by passing through the narrow channel, free from kelp, close southward of the island off Wittstein point; or from the eastward by passing southward of Bobzein islands, between them and Cape Francis, which is the best channel; it also leads to Port Palliser, into which vessels can easily run should easterly winds set in.

Francis island, of which Cape Francis is the eastern extreme, is well defined, stands out clear of the land, is 410 feet in height, and easily recognised by its inclined slopes and three superposed terraces.

In Penguin cove, on the northern side of Palliser road, is a stream of good water. The small round island fronting the cove is a good mark for Palliser road.

Port Palliser, or Schluss harbour, westward of Palliser road, is 3 miles in length by less than 5 cables in width, and affords excellent anchorage westward of the islet off the southern shore; the bottom is

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

sand except under the kelp, which in some places extends nearly to mid-channel.

Middle and Astronomer harbours, both southward of Port Palliser, afford good anchorage, but that of Middle harbour has at its entrance, a reef of rocks stretching completely across the channel about 5 cables within the entrance points, and quite 2 miles from its head. Both harbours should be approached northward of Cape Francis, and as if bound for Port Palliser.

The long narrow passage from Eclipse bay, southward of Maroon island, leading into the head of Astronomer harbour, has no more than 18 feet water in places.

Eclipse bay appears to be blocked by rocks and kelp; it has not been examined, and is open to easterly winds.

Hopeful harbour (*Lat. 49° 5' S., Long. 69° 39' E.*), southward of Eclipse bay, affords anchorage in its western portion in about 14 fathoms, sheltered from the prevailing winds, but open to the eastward. The *Challenger* anchored in this harbour in 15 fathoms, and found no difficulty in entering, as the dangers were all well marked by kelp.

Tysack bay, the next inlet to the southward, is similar in shape and direction to Hopeful harbour; but the water is deep, affording no anchorage except near its northern corner, where there are from 6 to 13 fathoms near the shore, with the bank deepening very suddenly.

Both Hopeful harbour and Tysack bay are fronted by banks of kelp; vessels must pick their way where the kelp is thinnest; in the approach to Tysack bay, no bottom was found at 15 fathoms.

WHALE BAY extends along the whole of the south-western side of Bismarck peninsula, and is about 14 miles in length in a N.W. and S.E. direction, with an average width of about $1\frac{1}{2}$ miles. Harbour island and Stosch peninsula form the south-western side of the bay, between which are several passages leading to German, Ubungs, Irish bays, &c.; the last named is the inner part or head of Hillsborough bay.

Henry island, known also as Cape Henry, is the south-eastern extreme of Bismarck peninsula and the north-eastern point of entrance to Whale bay. It is 207 feet in height, flat-topped, precipitous on all sides, and easily recognised.

Fairway rock, a small black islet only a few feet high, and apparently with deep water on its eastern side, but on which the sea always breaks, lies in the fairway of the entrance to Whale bay; kelp and rocky ground extend from it for about half the distance to Egg.

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 40' W.

point, near Cape Henry; it is advisable, therefore, in entering Whale bay either to keep close to the peninsula, or else to pass southward of Fairway rock; from thence the course is in mid-channel, in deep water, avoiding the foul ground off some of the points of Bismarck peninsula.

Jeschke harbour (*Lat. 49° 6' S., Long. 69° 21' E.*), the northern head of Whale bay, separated from Tucker strait by a narrow isthmus, through which there is a very narrow channel of only a few feet, affords the best anchorage in Whale bay, being sheltered from the prevailing strong winds by high hills; vessels may anchor just within Wolf point, the eastern point of the bay, in from 6 to 8 fathoms; small vessels may go up to the head, where there are from 10 to 11 fathoms, but to do this a 3-fathoms ridge has to be passed over.

Emperor basin, the western head of Whale bay, affords good anchorage on its north-western side, in from 6 to 17 fathoms. The south-western corner is filled with débris brought down by the Lindenbergl glacier, at the head of the bay is a long stretch of sand, which dries at low water.

Rosa harbour, near the North extreme of Stosch peninsula affording anchorage in about 7 fathoms, with 3 fathoms near its head, is a little cove perfectly protected from all winds. It is open to the northward, but sheltered by the Bismarck peninsula in that direction. On the other sides the hills rise abruptly from the shore.

Louise harbour, on the south-eastern side of Stosch peninsula, is a good and secure anchorage, but open to any swell that might fetch into Whale bay with E.S.E. winds.

German bay lies on the south-western side of Stosch peninsula, and the outer part is very deep. It may be entered from Whale bay; or from Hillsborough bay, through Hunter and Norton sounds, but one entrance to Norton sound is reported to be blocked by an avalanche of stones from the mountain. Prince Henry anchorage and Crown Prince basin afford good protection; the former, apparently under the island lying in the entrance to the basin, is landlocked, and affords anchorage in from 5 to 7 fathoms, but large vessels should moor as the space is limited.

Crown Prince basin is deep, except on the western side, where there is good anchorage. At its head are boat passages into Victoria lake. In entering Crown Prince basin, vessels may pass on either side of the island which lies in the passage.

Hidden bay lies southward of German bay and westward of the Borgen islands; it affords good anchorage, but is not easy of access

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 40' W.

from German bay, on account of the numerous islands and shoals fronting its entrance. The best channel is southward of Borgen islands, along the north-western coast of Tafelberg peninsula.

Winter harbour (*Lat. 49° 12' S., Long. 69° 26' E.*) is the inlet lying between Tafelberg and Roon peninsulas, and, from its name, was probably the resort of whaling craft in the winter season. It affords good anchorage at its head, near the foot of a round peak, 1,540 feet in height, off the mouth of a stream which runs through the valley northward of the peak. At the mouth of this river is the only place seen by the *Gazelle* where a vessel could possibly beach. This anchorage is now known as Ubungs bay.

Another good anchorage in Winter harbour is near the centre of the north coast of Roon peninsula in from 7 to 12 fathoms, under the three islands lying near the entrance. There is no drinking water to be obtained here.

Directions.—The best entrance to Winter harbour is through Hillsborough bay and Hunter sound. The round peaked hill at the head of Ubungs bay bearing N.W. by W. $\frac{3}{4}$ W. leads up Hunter sound. If going to bring up in the eastern anchorage, keep southward of the three islets in the entrance of the harbour, anchoring south-westward of them. If proceeding to Ubungs bay, pass northward of these islets, and from thence to the anchorage. Vessels can pass from Winter harbour to Irish bay through Husker strait, between Raven island and Roon peninsula, in not less than 7 fathoms.

Harbour island anchorages.—Harbour island, dividing the outer part of Whale bay from Hunter sound, has on its northern side a small bay, the entrance to which is 150 feet wide, with a depth of 3 fathoms and 2 fathoms in places inside, but a considerable swell enters with northerly gales. It has four anchorages in Islands bay, on its south-eastern side, but they are all more or less exposed to easterly winds; they all terminate in a long stretch of sand that dries at low water, and fresh water streams from the mountains run into the beaches. The southernmost is the only one that can be recommended, and it was formerly a station for seal hunters. The Rittmeyer islands form the south-eastern side of Islands bay. Tang pass, with a depth of 7 fathoms, lies between the two large southern islets; the channels between the others are not recommended.

HILLSBOROUGH BAY lies between the Rittmeyer islands and the large eastern peninsula of which Mount Crozier is the summit. Here it is about 4 miles wide, but, within, it is divided by Jackmann peninsula into two arms, known as Irish bay and Foundry branch.

General chart 748a.

GAZELLE BASIN.

Chart 2398, Kerguelen island. Var. 36° 40' W.

Schulz reef, which breaks, lies nearly midway in the entrance; this reef or rock uncovers at half tide, and probably never covers entirely, as it always breaks and is surrounded by kelp, which extends to it without a gap from Cape Wachenhusen; off which, in the direction of Schulz rock, is an island from 50 to 60 feet high and covered with verdure. Between this island and Schulz reef a breaker is reported, but there is 10 fathoms between the island and the breaker. The s.s. *Wakefield* was piloted through this channel in safety.

There are no difficulties in approaching Hillsborough bay, which may be recognised by Mount Campbell to the eastward, 460 feet high, rising from a low plain and resembling a truncated cone; Chimney top, a basaltic mass on one of the mountain tops; the rocky Rittmeyer islands; and the flat Fairway rock, before described; Henry island and the entrance to Whale bay are also easily distinguished.

Irish bay (*Lat. 49° 15' S., Long. 69° 30' E.*), the northern arm of Hillsborough bay, is about 14 miles in length, with deep water throughout. There is anchorage in northerly winds under the south-eastern coast of Raven island, in about 10 fathoms; also at the extreme head of the bay, but here the water shoals very abruptly to the loose rocks brought down by the glacier. These anchorages, although they afford a certain amount of protection, are not good, on account of the violent squalls and the bad holding ground.

Foundry branch, the southern arm, so named from the quantity of iron ore and limestone found there, forms the entrance to two secure and landlocked harbours, known as Gazelle basin and Fine Weather harbour. On the northern shore of Foundry branch are Pigeon and Seelhorst harbours, which, at their inner parts, afford protection from all winds. The *Jeanne D'Arc* has moored alongside the northern edge of the small spit of land projecting into the middle of Seelhorst harbour. On the southern side of the bay is some foul ground, which extends further out than is shown on the chart, and only breaks in heavy weather. Just outside and southward of the entrance to Gazelle basin is a sandy cove, with 6 feet water, entered by a narrow channel; there is a seam of coal here of a fairly decent quality.

Plan of Gazelle basin on 800.

GAZELLE BASIN has a gate-like entrance, with a navigable width of scarcely one cable and depths of from 9 to 12 fathoms, leading from the south-western corner of Foundry branch, and scarcely visible until close up to it. There is good anchorage in the south-western bight in 8 fathoms; here the *Eure* found perfect protection and comparatively fine and sunny weather during a stay of eight

General chart 748a.

Plan of Gazelle basin on 800. Var. 36° 40' W.

days; it is probably the best harbour in Kerguelen. Wild fowl were plentiful, and it appeared to be a great breeding place of sea birds. The whole neighbourhood was overrun by rabbits, which seemed almost to have destroyed the Kerguelen cabbage.

Depôt.—A depôt for the use of shipwrecked seamen was established here by the *Eure*. It is in the south-eastern part of Jackmann peninsula near the north-western shore of the little eastern pond shown on the plan and about $2\frac{1}{2}$ cables inland from the northern shore of Gazelle basin. It is in a cave at the foot of the western cliff of a rocky chasm, running north and south, and its position is indicated by a stone cairn $11\frac{1}{2}$ feet in height and about 14 feet wide at the base, erected on the summit of the West cliff of the chasm.

This cairn, visible from Gazelle basin, is painted black, and shows clearly against the grey rocks forming the background.

The entrance to the cave has been closed by large stones, and on the cliff a few yards above it is the inscription:—"Vivres et Vêtements, *Eure*. Janvier 1893."

In 1911 only one barrel remained, and that apparently contained tinned provisions. *

In the event of the cairn being destroyed, the following directions should be followed to find the depôt. Land on the northern side of the inlet opposite Gazelle basin, in a small creek, sheltered by a rocky point, where boats may go alongside under any circumstances of wind or tide. Proceed directly inland about quarter of a mile as far as the shore of a pond, then turn westward and follow the pond to its western end, where the chasm in which the depôt is situated will be seen on the left hand.

A flagstaff was also erected by the *Eure's* people near the channel leading from Gazelle basin into Fine-Weather harbour, the French flag hoisted, and an official report of the proceedings buried near each of the three shrouds supporting the flagstaff in three waterproof cases.

Chart 2398, Kerguelen island.

Fine-Weather harbour (*Lat. 49° 17' S., Long. 69° 36' E.*) is the continuation of the inlet westward from Gazelle basin. Depths of from 7 to 9 fathoms may be carried in southward of the islets, but the commander of the *Eure* did not consider it a good anchorage; northerly and north-westerly winds raise a sufficient sea to be dangerous for boats, and rocks awash were observed in several places.

Directions.—To enter Foundry branch and Gazelle basin, the hill 1,640 feet high, just eastward of Gazelle basin, may be steered for bearing S.W. by W. $\frac{1}{2}$ W.; in clear weather Mount Ross will be seen just southward of it, passing eastward and southward of both the

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 50' W.

Fairway and Schulz rocks. This course leads nearly to the head of Foundry branch, when the course should be gradually altered to the westward, keeping in mid-channel through the narrow entrance to Gazelle basin. The whaling steamers prefer to use the channel inside Schulz rock, as it is perfectly safe, and preferable to the direct course on account of the foul ground on the southern side of Foundry branch which only breaks in heavy weather.

Kirk harbour and **Vulcan cove** lie eastward of Foundry branch, in the southern corner of Hillsborough bay; they are divided from Foundry branch by a peninsula on which are two high hills, lying N.E. and S.W., and terminating in Cape Ahlefeld, off which projects a chain of small black islets almost awash. Both harbours are open to north-easterly winds. Kirk harbour is full of kelp, but no dangers were found; there is 10 fathoms at the entrance and 3 fathoms at the head, where a stream runs in. Vulcan cove has a reef covered with kelp right in the middle of the entrance, and 7 to 8 fathoms on both sides of the reef. Inside there are depths of 5 to 8 fathoms, and good anchorage except with a northerly swell, when it would be very unsafe.

Elizabeth harbour (*Lat. 49° 11' S., Long. 69° 51' E.*), on the eastern side of the entrance to Hillsborough bay, is a moderately safe anchorage. A reef covered with kelp lies right in the middle of the entrance, but there is a safe passage on either side. The *Gazelle* found the harbour overgrown with kelp.

Green island, lying about 6 miles eastward of Elizabeth harbour, is about half a mile from the coast, and a reef extends about 2 miles E.N.E. from it.

Plan of Accessible bay on 800.

ACCESSIBLE BAY, near the centre of the North coast of the eastern peninsula of Kerguelen island, has two moderately secure anchorages, viz.: Cascade reach and Betsy cove. Immediately off the bay are the Kent islands and Despair rocks; the former 5 miles, the latter 2 miles from a direct line joining the entrance points of the bay. The outer Kent island is 50 feet high, the inner and larger island S.W. by S. distant 6 cables from it is 80 feet high, and there is a rock above water between them with a large bed of kelp to the north-westward. The Despair rocks occupy a space 8 or 9 cables in diameter, and the highest rock is about 50 feet above sea level.

Cascade reach recedes about $2\frac{1}{4}$ miles with a width of 3 or 4 cables and affords anchorage in from 6 to 10 fathoms, but is open to north-easterly winds which throw in a heavy swell, when vessels would have to leave it.

General chart 748a.

Plan of Betsy cove on 800. Var. 36° 50' W.

Betsy cove lies eastward of Cascade reach and southward of Elizabeth head; it is about $2\frac{1}{2}$ cables in length N.W. and S.E., and nearly the same width in the entrance, where there is a depth of 10 fathoms, black mud and good holding-ground, gradually shoaling towards the marshy ground at its head, where landing may be effected on the beach in the northern corner. North-easterly winds send a considerable swell round Accessible bay and into Betsy cove, rendering the anchorage uneasy at such times. Vessels should moor in this cove, as the space is somewhat confined, and they would tail close in with easterly winds. The *Challenger* found it necessary to moor when a north-easterly wind set in somewhat unexpectedly.

The German Transit of Venus Expedition, 1874, established their station here.

Tides.—It is high water, full and change, at Betsy cove, at 0h. 35m. Springs rise 3 feet.

Chart 2398, and plans on 800.

Directions.—There is no difficulty in entering Cascade reach or Betsy cove. Mount Campbell, just eastward of them, is always a good mark, and seldom hidden by fog or mist. Kent islands and Despair rocks are easily recognised and avoided. Coming from the south-eastward, Mount Bungay, 220 feet high, and Mount Peeper, 650 feet high, southward of Mount Campbell, rising above the low land of the peninsula, are good marks. Mount Campbell is not visible unless bearing westward of N.W., being hidden from vessels near the coast by an intervening ridge.

Chart 2398, Kerguelen island.

Cape Digby (Lat. $49^{\circ} 5' S.$, Long. $70^{\circ} 31' E.$) is the eastern extreme of Kerguelen. Mount Campbell (described on page 479) lies about 8 miles north-westward of the cape. A reef which nearly always breaks extends seaward for a distance of three-quarters of a mile from the cape, and outside the reef is a large patch of thin kelp, in which a depth of 10 fathoms was obtained at a distance of $1\frac{1}{2}$ miles from the cape.

Breakers have been observed during heavy weather in many places along the coast between Cape Digby and the northern point of Accessible bay.

Royal bay, so named by the earlier whalers, lies between Cape Digby and the remarkable green mound about 3 miles to the southward. It is full of kelp, but there is reported to be anchorage there.

All along the coast from Cape Digby to Royal sound is kelp, and some thin patches have been seen from 3 to 4 miles from the coast.

Chart of Royal sound on 799.

Shoal water bay, on the northern side of Prince of Wales Foreland, runs in about 5 miles, and is full of kelp. Breakers have been

General chart 748a.

Chart of Royal sound on 799. Var. 37° W.

noticed in the middle of the entrance, but there is a channel into the bay on both sides; that on the northern side is close round Bluff point, in thin kelp, and has depths of from 8 to 5 fathoms; the one on the south side is along the Foreland inside the kelp, and has a depth of 3 fathoms.

ROYAL SOUND, on the south-eastern side of Kerguelen island, is a magnificent sheet of water, extending a distance of 20 miles from its entrance to its head, and, with its various arms, occupying an area of nearly 200 square miles. A portion of this area is taken up by an archipelago of flat-topped islands of various sizes, the largest, Long island, being 8 miles in length; these are congregated towards the head of the Sound; between them there appears to be deep water generally, and in some of the channels the depths are very considerable.

The head-quarters of the Bossière Company, who have leased Kerguelen, is at Port Jeanne D'Arc, inside Long island.

The entrance to the Sound is open to the south-eastward, and is 5 miles wide between Prince of Wales Foreland and the islands lying off Wyville Thomson peninsula. With the exception of Percy rock, on the southern side of the entrance and the rocks off Balfour island, no other rocks have been seen, but it is highly probable that others may exist; the golden rule is to look out for and avoid kelp.

Prince of Wales Foreland (*Lat. 49° 25' S., Long. 70° 23' E.*), on the north-eastern side of the entrance, is a long-backed peninsula attaining a height of 840 feet above the sea; on its southern side are precipitous cliffs, but the northern side slopes gradually to the shore of Shoal water bay. A ledge of rocks extends about 2½ cables off the south-eastern point of the Foreland. The wreck of the *Winnipeg* lies on the south-west side of the Foreland.

Harston rock, about 20 feet high, lies 1½ miles southward of the extreme of the Foreland. Kelp lies eastward of the rock and between the rock and the Foreland. The northern *red* sector of Murray island light shows from the extreme of the Foreland to Harston rock.

Balfour rock, about 20 feet high, lies 4 miles southward of the extreme of the Foreland. A rock which breaks in heavy weather and is covered with kelp lies about 6 cables northward of Balfour rock; breakers have also been observed about three-quarters of a mile eastward of Balfour rock. The southern *red* sector of Murray island light shows for a distance of 8 cables either side of Balfour rock.

Wyville Thomson peninsula, forming the southern side of the entrance to Royal sound, is rugged mountainous land, attaining a height of 3,160 feet in the mount of the same name; on the spurs are

General charts 2398, 748a.

Chart of Royal sound on 799. Var. 37° W.

several conspicuous conical peaks, varying from 1,200 to 2,500 feet in height. No. 3 Transit of Venus Station was on the N.W. extreme of this peninsula.

Murray island is the principal one of several islands lying off the north-eastern side of Wyville Thomson peninsula. It is about one mile in length, 380 feet high, and separated from the mainland by a narrow channel about 3 cables wide. Buchanan island, the outer island, is 215 feet high, and lies about 3 miles southward of Murray island.

Light (occasional) (*Lat. 49° 30' S., Long. 70° 16' E.*).—On the northern promontory of Murray island is exhibited, when the Kerguelen Company's whaling vessels are working outside or expected in, at an elevation of 157 feet above high water, a *flashing light every five seconds*, with *white, red, and green sectors*, thus: *Flash, half a second; eclipse, four and a half seconds*. For sectors, *see Light list and charts*.

Percy rock, on which the sea breaks when there is any swell, lies $1\frac{1}{2}$ miles southward of Buchanan island.

The *green sector* of Murray island light shows from the peninsula to one mile northward of the rock.

Plan of Island harbour on 799.

Island harbour, 11 miles within the entrance of Royal sound, is a well-protected anchorage formed by a group of four islands, named, Cat, Grave, Hog, and North islands, the passages into which are all safe and deep, except that between Hog and Grave islands; this passage, besides being shallow, is blocked with kelp; that weed also marks the dangers extending from the other islands. There is good anchorage in 11 fathoms, mud, near the centre of the harbour.

In April, 1910, the s.s. *Wakefield* anchored here in a S.W. gale, but with both anchors down she dragged out of the harbour, narrowly escaping the N.E. point of Hog island. When the anchors were weighed they were covered in kelp.

From the entrance of the sound to Island harbour, the depths vary from 15 to 30 fathoms, mud; above Island harbour the depths are irregular.

Island harbour was formerly the head-quarters of whalers at Kerguelen. Here they came yearly to receive supplies and ship their oil for home; two huts were erected on Hog island for the purpose of boiling down oil; and from here they started for Heard island.

Very good anchorage is reported between Cat and Grave island, close to the patch of kelp growing near Cat island.

General charts 2398, 748a.

Chart of Royal sound on 799. Var. 37° W.

Observatory bay, at the head of Royal sound, and 7 miles N.N.W. from Island harbour, is a narrow inlet about one mile in length, North and South, with from 4 to 9 fathoms, black sticky mud and excellent holding ground. Both the *Voyage* and *Supply* rode out numerous gales in this anchorage, and also in Supply bay and Island harbour, without dragging. Here No. 1 Transit of Venus party were stationed from the end of November, 1874, to the end of February, 1875; the house still remained when the spot was last visited.

Tides.—It is high water, full and change, at Observatory bay, at 11 hours (approx.); springs rise 5 feet, neaps 2½ feet.

Long island, about 8 miles long and from one to 2 miles wide, is from 300 to 400 feet high, and protects Supply bay and Port Jeanne D'Arc from easterly winds; its southern and eastern coasts are very steep. Northward of the island a fiord runs inland for a distance of about 11 miles, becoming very shallow towards the head. There are a number of Iceland sheep, bred by M. Bossière, on the island.

Supply bay, the position occupied by No. 2 Transit of Venus party, in 1874-75, is about 7 miles in a direct line south-westward of Observatory bay, and lies abreast the northern end of Long island. It is about one mile in length N.W. by W. and S.E. by E., and very similar in all respects to Observatory bay.

Port Jeanne D'Arc (*Lat. 49° 34' S., Long. 69° 49' E.*).—The head-quarters of M. Bossière's company is about 2 miles southward of Supply bay. The settlement is a large one, and there is a wooden jetty, close to the end of which are two large buoys. There is a large factory for boiling down whale blubber; the whales are all caught in Hillsborough and Whale bays, being towed round to the settlement by the small whalers. Small repairs to vessels may be effected here. The holding ground at Port Jeanne D'Arc is not very good, and vessels are recommended to have steam ready in bad weather. On the plateau behind the settlement is a conspicuous round reddish-coloured hill called Red Dome.

Tides.—It is high water, full and change, at Port Jeanne D'Arc about 0h. 0m.; springs rise 6½ feet, neaps 3½ feet, approximately, but they are much influenced by the wind; the tide, with an easterly wind rising one foot higher and standing longer than with a N.W. gale.

Dangers.—A patch of 4 fathoms, with thick kelp covering it, lies about three-quarters of a mile north-east of the western part of Wyville Thomson peninsula; a thick clump of kelp, the depth on which is not known, but should be avoided, lies southward of Inskip island; and a patch of 4 fathoms, with thick kelp over it, lies nearly in mid-channel off the southern end of Long island.

Chart of Royal sound on 799. Var. 37° W.

Directions.—The safest course into Royal sound is to pass about one mile southward of Harston rock, and when between Harston and Balfour rocks steer N.W. by W. for the northern end of Suhm island. If proceeding to Island harbour pass northward of Haynes island, if proceeding to Observatory bay or Port Jeanne D'Arc pass midway between Haynes and Suhm islands. If for Observatory bay then pass westward of Hog and Grave island, and if for Port Jeanne D'Arc pass eastward of Long island and close round the southern point of the island, avoiding the dangers previously mentioned. If proceeding from Observatory bay to Port Jeanne D'Arc vessels should pass westward of Blakeney, Penn, and Inskip islands, and then eastward of Long island. The channel westward of Long island is not recommended, although the *Supply* frequently used it.

In all cases if possible avoid kelp. *See* Caution, page 483.

Greenland harbour lies between Wyville Thomson peninsula and that south-westward of it, the head of the harbour being the isthmus connecting the two peninsulas. The entrance is about 8 miles south-westward of the fairway of Royal sound; the harbour is about 7 miles in length, at first in a north-westerly and then in a westerly direction, by 1½ miles in width, and its sides rise abruptly from the water's edge. About half-way to its head the harbour has the appearance of being blocked by kelp and rocky ground, but the master of the whaling schooner *Roswell King* stated that a deep channel existed between the ledge and the southern shore; if so, there is a landlocked anchorage within. Below the reef, the harbour is exposed to south-easterly winds; the *Challenger* found excellent anchorage here in about 11 fathoms. The haul-over between the harbour and Royal sound is about a third of a mile wide, and 25 feet high.

Greenland harbour is probably subject to sudden and heavy north-westerly squalls, owing to the lowness of the land in that direction. In passing the entrance, the *Vulage* noticed spray being blown across the harbour when the force of wind outside was only from 5 to 6.

Chart 2398, Kerguelen island.

Cape Challenger (Lat. 49° 43' S., Long. 70° 5' E.), the South extreme of Kerguelen island, lies about 9 miles south-westward of Greenland harbour. It is a ragged point, with two pinnacle rocks of considerable height close to its extreme. *See* view on chart.

Between Cape George and Cape Challenger, the coast is high and precipitous; midway between, in a break of the cliffs, is Big Belly bay, from which a deep ravine trends to Mount Crosbie.

Westward of Cape Challenger, the coast is not so precipitous, descending less abruptly from the double peak of Mount Tizard,

General chart 748a.

Chart 2398, Kerguelen island. Var. 37° W.

2,720 feet high, and the single cone of Mount Evans, 2,600 feet high. The projecting points of the coast westward to Swains bay have each of them tapering basaltic columns of considerable height.

SWAINS BAY is an inlet about midway between Mount Evans and Mount Ross, and about 11 miles in length in a north-easterly direction. The entrance is about $3\frac{1}{2}$ miles in width, with some high islands and islets about mid-channel. The western channel only has been examined. This channel has a depth of about 20 fathoms in the entrance, gradually decreasing to 5 fathoms at 4 miles within, abreast of a black rock on the eastern side; this depth continues for about 2 miles over a flat marked by kelp, within which the water again deepens, and so continues until near the head of the narrows into Volage bay. The western arm of Swains bay and also the arm between it and Volage bay are now stated to run in much further than was first thought, and towards Table bay.

The western arm is subject to heavy squalls, which sweep down the low valley at its head; it is therefore not recommended as an anchorage.

Volage bay (*Lat. 49° 31' S., Long. 69° 41' E.*), at the head of the north-eastern arm of Swains bay, is separated by two small peninsulas from the western head. It is a narrow inlet about one mile in length in a N.N.W. direction, and affords good and secure anchorage in 10 fathoms or less, soft mud. The water shoals rapidly from 20 and 30 fathoms immediately outside the bay to 10 fathoms at its mouth. The *Volage* experienced several gales during her stay here, but the water was always smooth, and on this account it was preferred to Observatory bay.

The entrance is from Swains bay, passing eastward of the two peninsulas extending from its head, and westward of the islands. The least depth found was in the narrow part of the channel, between the peninsula 250 feet in height, and the point of the island 200 feet in height, there being 12 fathoms in mid-channel and 9 fathoms close to the kelp.

Water.—Here, on the peninsula, is a stream from which the *Volage* watered during her stay, the launch lying close alongside the rocks.

SOUTH-WEST COAST.—The description of this coast, as well as that of the west coast, is mainly derived from the personal observations of Commander Ring, Norwegian R.N.R., who commanded the s.s. *Jeanne D'Arc*, and from information supplied to him by various masters of the Kerguelen Whaling Company's vessels.

Penmare point lies about 9 miles N.W. from the western entrance to Swains bay, and Mount Ross lies eastward of the point, a

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 50' W.

distance of about 4 miles. The coast between Penmare point and Swains bay is bold, steep, and apparently clear of off-lying dangers. Breakers have been observed off Penmare point, and also off the Sugarloaf, 4 miles to the northward.

Baie D'Audierne is the name given to the deep bight between Penmare point and Cape Dauphin, in which are Table, Iceberg, and Sprightly bays. These bays and their off-lying islands are only approximately charted, so a sharp lookout and frequent soundings are necessary when navigating here. Most dangers are no doubt marked by kelp, but this cannot be depended upon with dangers so far from the land and in such an exposed position.

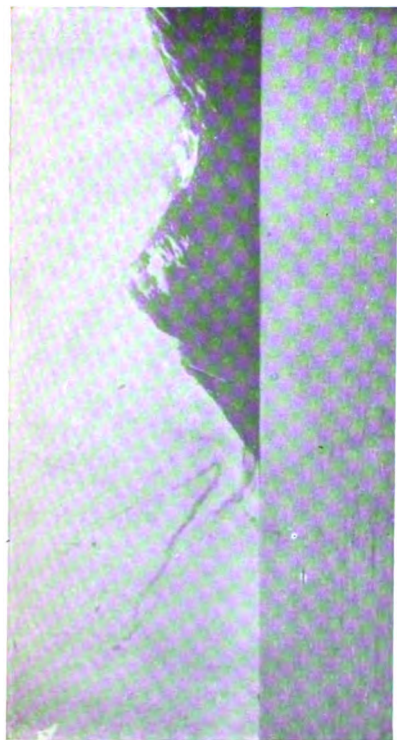
Table bay runs in N.E. by N. for a distance of about 5½ miles. On the eastern point of entrance is Table mountain, which is very conspicuous. At the head of the bay is a vast sandy beach, and a glacier descends from Cooks glacier to within 2 miles of the beach; on the western side of the bay is a narrow arm running inland. There are several good anchorages in the bay and its approaches. Great caution is necessary in approaching the bay on account of the off-lying dangers. The outer known danger lies about 5 miles S.W. by S. from Table mountain, but its position is only approximate.

Iceberg bay is 2½ miles westward of Table bay. The best anchorage is said to be at the head of the bay; on the western side is a deep arm, similar to that of Table bay. At the mouth of the bay are rocks and kelp on both sides, but the channel in the middle is clear. The land on the eastern side of the head of the bay is reported to be hot, and some sealers reported they had seen steam rising further inland.

Sprightly bay, about 5 miles westward of Iceberg bay, has no decent anchorage, and the squalls are sometimes very fierce from the northward; there is a bar or bank about half-way up the bay, and two streams run down from the mountains to the head of the bay.

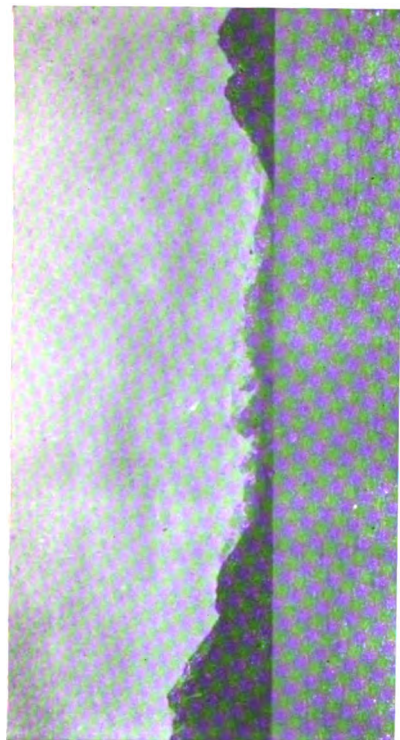
Cape Dauphin (*Lat. 49° 41' S., Long. 69° 5' E.*), so named by Captain Kerguelen, is bold and steep (*see view a*); it lies about 3 miles southward of the entrance to Sprightly bay, and is distant about 15 miles from Penmare point. About 4 miles westward of Cape Dauphin is the small cove White Ash bay, and about 1½ miles south-eastward of the cove is Round rock, one mile from the land, and vessels of any draught can pass inside it. About 3 miles westward of White Ash bay is Lion Marin bay, or Gros Ventre, so called after one of Kerguelen's vessels that anchored here (*see view b*). Into Lion Marin bay a glacier descends, and a valley connects the head of the bay with the bay just inside Cape Dauphin. The coast between Cape Dauphin and Cape Bourbon is steep.

General chart 748a.



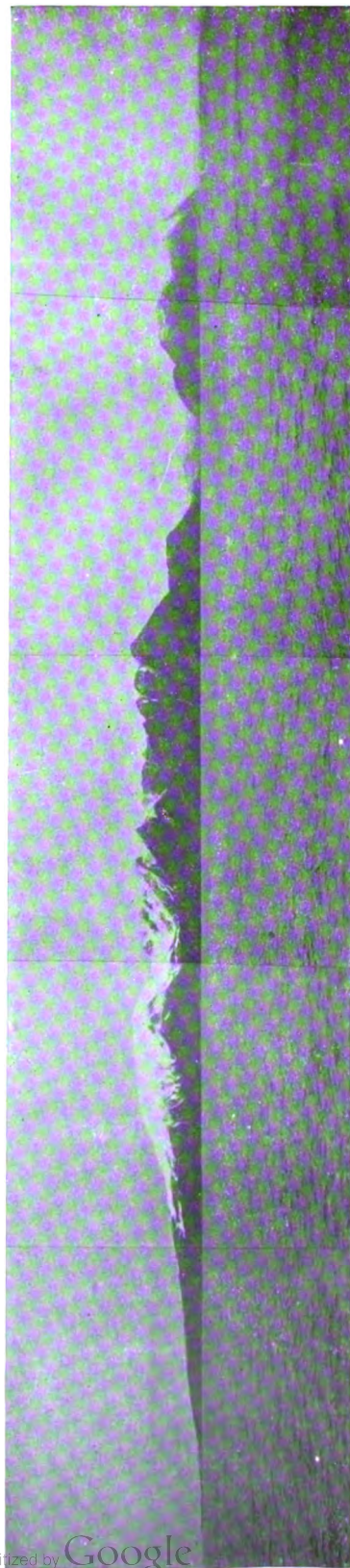
(a)

Round rock. Mingan or Round island.
(Low and faint)
Cape Dauphin from the Southward.



(b)

Entrance to Lion Marin bay.



(c)

Cape Bourbon.

Snowy peak.

Kerguelen island—South-west Coast from the Southward.

Cape Dauphin.

Chart 2398, Kerguelen island. Var. 36° 50' W.

Cape Bourbon, the western extremity of Kerguelen, is low (see view *c*, page 504, and view *a*, page 506). A depth of 70 fathoms was obtained at a distance of one mile off the point. Snowy peak, which is ice-capped, and is probably the southern limit of Cooks glacier, lies about $3\frac{1}{2}$ miles eastward of the cape.

Mingan or Round island is about 300 feet high, and only about 500 yards in diameter; it lies about $4\frac{1}{2}$ miles S. by W. from Cape Bourbon. Three small rocks lie northward and eastward of Mingan, the position of the eastern rock is doubtful.

Chart 748a.

Benodet islets and **Solitary** island also lie southward of Cape Bourbon. A breaking patch about a quarter of a mile in extent lies S. by E. a distance of about one mile from the south-eastern island of the Benodet group. The most recent information places these islands in the following positions: Solitary island bears S. 61° W. distant $17\frac{1}{4}$ miles from Cape Bourbon, and S. 74° W. distant $14\frac{3}{4}$ miles from Mingan island. Solitary island bears N. 49° W. distant $7\frac{1}{4}$ miles from Benodet islets, and Benodet bears S. 45° W. distant $12\frac{1}{4}$ miles from Mingan.

Salamanca rocks (*Lat. $49^{\circ} 58'$ S., Long. $69^{\circ} 31'$ E.*), sighted and reported by Captain Robson when commanding the *Salamanca*, in 1880, on her passage to Australia, and also sighted by Captain Greenstreet in 1893, are a cluster of dangerous rocks about 300 yards in extent; the north-western rock is 10 feet high, and the south-eastern extreme of the reef is awash, with apparently deep water all round. They lie with Cape Bourbon bearing N.N.W. $\frac{3}{4}$ W., distant about 33 miles, and Cape Challenger E. $\frac{1}{4}$ S., distant 27 miles.

Current.—With a strong north-westerly gale blowing the s.s. *Wakefield* experienced a strong northerly set in the neighbourhood of Salamanca rocks.

Chart 2398, Kerguelen island.

WEST COAST.—The positions of Cape Bourbon, Fortune island, and Cape St. Louis were fixed by Commander Ring by means of sun observations under favourable circumstances, and may be relied on as fairly accurate, the remainder of this coast has been sketched in by the same officer.

From Cape Bourbon the coast runs N.E. to Hell Gate, a distance of about 9 miles. No off-lying dangers have been observed off Bonfire beach, but broken water was seen about 4 miles off Hell Gate. The coast from Bonfire beach to Hell Gate is steep, and there are no glaciers. From Hell Gate the coast runs in an easterly direction for 13 miles to Melissas and Young Williams bay. The coast between Hell Gate and Melissas bay is steep and forbidding. Glaciers descend into the sea in three or four

General chart 748a.

Chart 2398, Kerguelen island. Var. 36° 30' W.

places. Between Surfy hole and Melissas bay heavy breakers have been seen. The volcano marked on the chart in this locality has not been recently seen. On the northern side of this bay are the small harbours Mussel bay and Blueskin reach; off the latter are apparently some rocks, and a rock lies about 2 miles to the southward.

Marianne strait, between Saddle or West island and the main island, is sheltered from all winds, and is the warmest place on the west coast; outside the strait the cold is generally intense, especially with the wind blowing off Cooks glacier. The southern entrance is ugly-looking, only about a cable wide, but safe; the sea breaks heavily on both sides, but no bottom at 15 fathoms was found. (*See view b.*) Inside there is secure anchorage and good holding ground. The s.s. *Jeanne D'Arc*, drawing 18 feet, has been in here, and also all the other whaling steamers. The northern exit is very narrow, but deep; ice from Thunder bay glacier sometimes enters the strait through this passage.

Saddle or West island is about 7 miles long and $3\frac{1}{2}$ miles wide; the island is most imposing from every direction, and cannot be mistaken. Looms bay, on the southern side, is apparently a safe anchorage for small vessels, but it is full of kelp. Cape St. Louis is the western extreme of Saddle island. About $1\frac{1}{2}$ miles northward of the cape is a very narrow inlet, with a depth of 20 fathoms in the entrance, which is only 100 feet wide. The inlet runs in about $1\frac{1}{2}$ miles, and is 250 feet wide, there is 4 fathoms at the head about 50 feet from the land. The cliffs on each side prevent any landing, but at the head is a small beach where planks and wreckage was found. Monument cove, on the northern side of Saddle island, is very small, but the monolith and monument-like formation is very impressive; the land between Monument cove and Looms bay, on the south side, is low, and may be easily crossed. Duncan cove, on the eastern side of the island and the northern side of the exit from Marianne strait, has good anchorage in 8 fathoms, with good holding ground.

Fortune islands (*Lat. 49° 35' S., Long. 68° 27' E.*) were the first land sighted by Kerguelen, and are named after his vessel; they consist of three islands or rocks, and lie W. by S. $\frac{1}{2}$ S. a distance of about 12 miles from Cape St. Louis.

Thunder bay is the next bay northward of Marianne strait; it is about 3 miles deep, and the same distance wide. A bar with a least depth of one fathom stretching nearly across the bay partly protects the anchorage inside, where there are depths of 6 to 8 fathoms, but the anchorage must always be a dangerous one on account of its facing the prevailing winds and also on account of the ice coming down from the glacier. The glacier lies on the southern side of the bay. A reef that was seen to break, but whose position is doubtful, lies about the middle of the bay, and about a mile outside the bar.

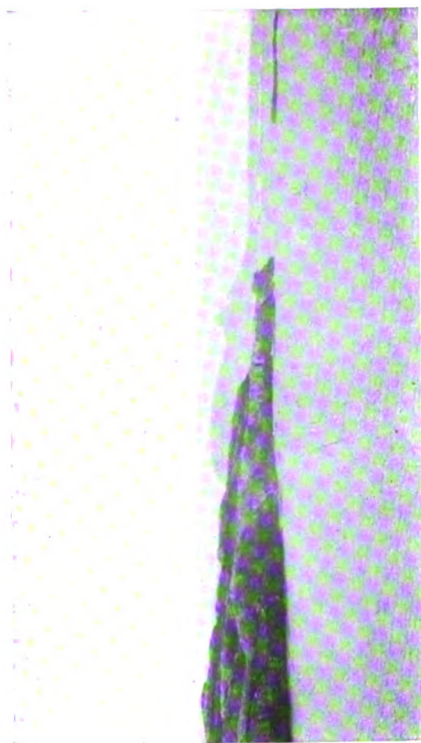
General chart 748a.

(a)



Snowy peak.
Cape Bourbon
(low.)
Cape Bourbon from the Westward.

(b)



Hell Gate (distant).
Marianne Strait.

Chart 2398, Kerguelen island. Var. 36° 30' W.

Shot bag bay, lying about 6 miles northward of Thunder bay, is open to the prevailing westerly winds, so can hardly be a safe anchorage, though the remains of sealers' huts were found in the southern part of it. About the middle of the bay is a rock that breaks. About a mile inland from the head of the bay is a big lake into which a glacier descends, and a stream runs from the lake to the head of Thunder bay. Southward of Shot bag bay is a small almost circular bay one-third of a mile in diameter, with two inlets, both being about 25 feet wide; a whaling motor boat sheltered behind two small islands in the north-eastern corner of the bay during a gale, and found 2 fathoms of water. The coast between Shot bag bay and Africa bay is very steep; breakers were seen off this coast, and estimated to be 2 miles out, but very probably they are more distant than that.

Africa bay (*Lat. 49° 11' S., Long. 68° 52' E.*), so called by the sealers, has two arms, the northern one is connected with Bear-up bay on the north-east coast of Kerguelen by a gorge about 5 miles long, and the walls on both sides of the bay are almost perpendicular. Breakers were seen about 2 miles off the entrance to Africa bay, but their position is doubtful, and they may lie further off.

From Africa bay to Saltskin point, a distance of about 13 miles, the coast is high, steep, and ugly-looking, but, except for a breaker about 2 miles off-shore on the northern side of the entrance to Africa bay, no other dangers were observed. Eastward of Saltskin point the coast runs in, and there are several islands and breakers in the bight; there is apparently anchorage for small vessels there. The land between the bight and Cumberland bay on the north-east coast of the main island is low, has two lakes in it, and can be crossed in about 2 hours.

Cape D'Aiguillon lies about 7 miles N.E. by N. from Saltskin point. From Cape D'Aiguillon the coast runs about E. by N. for a distance of about 13 miles to Cape Aubert, which is the northern point of Kerguelen; the whole of this coast has a precipitous and forbidding appearance. No dangers were observed off-shore except one close to the northern side of Cape D'Aiguillon. The islands lying off this coast and the channel between have been described on page 485.

Chart of Heard and McDonald islands on 802. Var. 40° 20' W.

HEARD and McDONALD ISLANDS.—The **McDonald islands** lie about 26 miles north-westward of Cape Laurens, the north-western extreme of Heard island; they consist of two small barren islands close together; and of Meyers rock, an out-lying sugar-loaf rock, one mile northward of them. They were discovered by Captain McDonald of the British ship *Samarang*, in January, 1854; see view on chart.

General chart 748a.

Chart of Heard and McDonald islands on 802. Var. 40° 20' W.

Landing is impracticable on account of the precipitous cliffs forming their coastline. The southern end of the large island is a saddle hill 620 feet high; its two peaks are in line on a North and South bearing. The channel between the two islands is about one cable wide.

Meyers rock (*Lat. 53° 1' S., Long. 72° 30' E.*) is a precipitous pinnacle 450 feet high and 200 yards in diameter at its base.

In 1873, the *Challenger* rounded the McDonald islands at a distance of from 3 to 5 miles, and could detect no off-lying dangers.

HEARD ISLAND was discovered by Captain Heard of the American ship *Oriental*, in November, 1853; it is about 25 miles in length N.N.W. and S.S.E., 9 miles in width, and estimated to be 6,000 feet in height in the centre. In March, 1910, the summit was in complete volcanic activity with immense clouds of smoke rising from it. The island, covered by a glacier, lies nearly in the direction of the prevailing wind, and having no deep bays, has consequently no secure anchorages. Corinthian bay is the best.

Glaciers.—From the summit of the island, named Big Ben by the sealers, but now called Emperor William's peak, large glaciers descend and in many places reach the sea, where the waves, dashing against them, wear away their bases, forming overhanging ledges of ice, which break off by their own weight when forced sufficiently forward by the gradual descent of the glacier. Here and there low hills, separated from the main mountain mass, offer an obstruction to the ice and prevent its covering the land on their lower sides. The low peninsula at the head of Corinthian bay is thus free from ice.

The *Challenger* considered the water deep all round Heard island, except off the south-eastern point, where a bank of black mud and sand is said to extend 20 miles or more, but besides Wakefield reef, Lieut. Seymour considered that there was shoal water off the S.W. coast. A few detached islets and rocks lie near the coast. Red islet, near Cape Laurens, the north-western extreme of the island, is 200 feet in height and half a mile off-shore; the passage inside it is foul.

Wakefield reef, which was breaking heavily when discovered, is about half a mile long, and lies about 5 miles N. by W. from Cape Arcona. This position is only approximate, as the bearings of the land could not be made to fit in.

Shag islets, of which the highest and central one is 200 feet above the sea, and lies $7\frac{1}{2}$ miles eastward of Rogers head, the northern point of Corinthian bay, consists of three islets in all, and they occupy a line about one mile in length N.E.

General chart 748a.

CORINTHIAN BAY.

Chart of Heard and McDonald islands on 802. Var. 40° 20' W.

and S.W. Sail rock, the north-eastern islet, is about 50 feet high. The south-western rock is smaller.

Corinthian bay (*Lat. 53° 5' S., Long. 73° 26' E.*) is on the north-eastern side of the island, between Rogers head and Saddle point; it affords anchorage in 10 fathoms, with Saddle point bearing S.E. by E. $\frac{1}{4}$ E., and Church rock, 30 feet high, at the head of the bay, S. $\frac{3}{4}$ W. The *Challenger* anchored on these bearings. In entering the bay, Rogers head, a conspicuous double-peaked foreland, 500 feet in height, should be given a wide berth, as sunken rocks extend a considerable distance off it. Squalls are usually very violent off the head, and until the bay is well open. The anchorage is not well protected, it being open to north-easterly winds and partly so to the ordinary westerly swell.

The latest information concerning this island is from Lieut. Hobart Seymour, R.N., in s.s. *Wakefield*, when searching for the lost steamer *Waratah*, April, 1910. He was unable to land or approach the eastern coast, but he steamed close to the western coast, and reports that this side as shown on the chart is considerably out, Cape Arcona coming out about $1\frac{1}{2}$ miles further, and the deep bight south-eastward of the cape does not exist. At the time of the *Challenger's* visit in 1873, sealing vessels used to come over from Kerguelen in October, and remain until the end of December, the best season, during which period they anchored off the several temporary settlements to collect the blubber which was rafted off to them, and transferred to the annual barque arriving with supplies from America. The work of shipping the blubber was extremely hazardous, as easterly winds are by no means uncommon; the vessels were specially provided with heavy anchors and chains to ride out gales. Mechanics bay and Spit bay were two of the frequented anchorages. At this time there were 40 sealers on the island, distributed in parties along the coast. Six were stationed in Corinthian bay, living in huts sunk in the ground, partly to protect them from the strong westerly winds which blow through the gap in the island, and partly for warmth, as in the winter they covered the huts with snow. They varied their salt beef diet with penguins, which they considered excellent food; for fuel they used the fat of penguins. There are no ducks on the island, and the cabbage is of a poorer growth than that of Kerguelen. The island is now entirely deserted.

Landing.—On the western shore of Corinthian bay, the land slopes down from the high peak of Rogers head, wonderfully marked by its numerous very thin layers of lava overlying one another, towards the head of the bay, and ending in a low level isthmus which separates Corinthian bay from the shallow Atlas cove to the westward,

General chart 748a.

Chart of Heard and McDonald islands on 802. Var. 40° 20' W.

and from South-west bay on the opposite side of the island. A line of low black lava cliffs, in the holes of which cape pigeons build their nests, borders the western shore of the bay, and prevents landing; except at one small rocky point, where, however, the sea is rarely smooth enough to allow communication. At the head of the bay is a low black sandy beach on which the sea constantly breaks, but the sealers state that it is smooth enough to effect a landing on an average one day in every three; the beach is so low that in bad weather and at high water the sea breaks and runs some distance in-shore.

At the eastern end, the beach is joined by the precipitous face of a glacier some 50 or 60 feet high, which extends nearly to Saddle point, and prevents communication along that shore; but from Mechanics bay to the south-eastward there is a track along the beach to the southern point of the island, which allows communication without the necessity of crossing any of the glaciers.

Landing is better in Mechanics bay than in Corinthian bay, but the anchorage is not so good. There is also landing at the southern part of Spit bay, during south-westerly winds; but landing on the island generally is difficult. There is little or no kelp around Heard island; probably the great quantity of fresh water from the glaciers prevents its growth.

Current.—Between Heard and Kerguelen islands the s.s. *Wakefield* experienced a strong north-easterly set whilst a N.E. gale was blowing.

Winds and weather.—The weather in this vicinity is foggy and boisterous, and although the prevailing wind is westerly, gales from the northward and eastward are not at all uncommon. As a rule, westerly winds bring moderately clear weather, easterly winds much fog or mist; the latter prevent all communication with the shore for several days at a time, and north-westerly winds are nearly as bad. December is the finest month, and at this season a fortnight's fine weather might be experienced. In the winter the whole island is snowclad, at which time the sealers had to melt snow to obtain water, so that the temperature must be lower than Kerguelen, where the water at sea level seldom freezes. The *Challenger* found the temperature of the air in December to be from 39° to 36°, the same as the sea water, and therefore a correct indication of the mean for that time of year. The climate is considered far inferior to Kerguelen.

Plan of St. Paul island on 1921. Var. 26° 50' W.

ST. PAUL and AMSTERDAM ISLANDS.—ST. PAUL ISLAND (Lat. 38° 43' S., Long. 77° 31' E.) (See views on plan, and page 512), the southernmost of

General chart 748a.

Plan of St. Paul island on 1921. Var. 26° 50' W.

two remarkable isolated islands of volcanic formation in the South Indian ocean, was surveyed by Captain H. M. Denham, H.M.S. *Herald*, in 1853, and is about $2\frac{1}{2}$ miles long, North and South, $1\frac{1}{2}$ miles in width, and attains a height of 862 feet. A considerable portion of the area is occupied by Crater lake, a circular basin about 6 cables in diameter, formed by the crater of the volcano, which has 28 fathoms water in the centre, and is entered from the eastward, over a bar having a depth of $6\frac{1}{2}$ feet at high water, springs. When visited by Vlaming in 1697, the portion forming the bar was 7 or 8 feet above water. The fishermen who frequent the place consider that the bar is a solid ridge, and that the rocks occasionally seen on it are boulders or débris washed up during gales which soon find their way down into the crater.

The French Transit of Venus party was established here, and they left a stone marking the spot with the following inscription: "Passage de Venus Soleil Observation Mission Francaise, 9th Decembre, 1874. lat. $38^{\circ} 42' 51''$ S., long. $75^{\circ} 11' 00''$ E. ($77^{\circ} 31' 14''$ E. of Greenwich)."

The French war vessel *Bourdonnais* visited this island and hoisted the French flag in October, 1892. It was again visited by the French transport *Eure* in January, 1893, when a dépôt of provisions for shipwrecked people was established.

The eastern coast of the island is inaccessible, except just eastward of Smith point, the northern extreme of the island.

Ninepin rock, the southernmost of the islets and rocks off the eastern coast northward of the crater, is composed of horizontal layers of lava, piled regularly one upon the other to a height of 255 feet. The face of these layers is cracked and divided by perpendicular fissures, many of which are filled with veins of obsidian or volcanic glass (*see* views on plan and page 512). The soil is altogether volcanic; for, when the crew of H.M.S. *Megara*, which vessel was beached, to save life, on St. Paul island in June, 1871, were excavating for building purposes, they found the ground hot, smoking, and strongly impregnated with sulphur; they also found a sort of clay that was used as a substitute for soap, producing a good lather.

The sloping sides of the crater contain many thermal springs, varying in temperature to boiling heat, and stagnant pools with a temperature varying from 80° to 130° exist in every part of the island. These waters when cold are drinkable, and when used as a bath are esteemed a specific for rheumatism.

Resources.—There are no trees or shrubs of any sort, but the hills are covered with long coarse grass, some ferns, mosses, and mushrooms, also a few cabbages and potatoes which must have been culti-

General chart 748a.

Plan of St. Paul island on 1921. Var. 26° 50' W.

vated at some time. Some of the grasses and dandelions were used by the crew of the *Megara* as antiscorbutics during their sojourn of several months on the island. There are wild goats, wild cats, rats, mice, and quantities of rabbits; petrels, gulls, and whale birds; in August, vast flocks of penguins invade the island for breeding purposes, but there are no land birds. Both fish and crayfish abound, affording an unlimited supply of wholesome food, with the additional advantage of the boiling springs at hand to cook them.

The English four-masted barque *Holt Hill*, 2,366 tons, was wrecked on the weather side of the island, on the night of November 13th, 1889; the crew, with one exception, managed to escape by climbing the precipitous cliffs, from 200 to 300 feet in height, living chiefly on penguins, until taken off 8 days later by the barque *Coorong*, of Adelaide.

Water.—A path runs north-west from the provision depôt to a pool where at low tide hot fresh water will be found; this water is sweetest when the tide is just beginning to rise.

On the summit of the highest hill to the northward is a pole from which a beaten track runs to the north-westward, and leads to three pools, where sweet water was found 30 days after there had been rain.

During the winter months an abundant supply of water may be obtained from a pool on the northern side of the crater; there are several hot sulphurous springs near the same part.

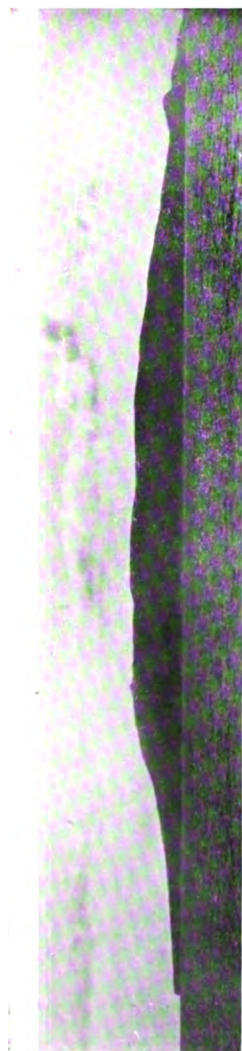
Inhabitants.—In 1871, there were two Frenchmen residing on St. Paul, employed collecting water in casks for the use of whalers, who then used to visit the island during the summer months. In 1880, a party of twenty-nine fishermen from Réunion were at St. Paul, engaged curing fish; they had a schooner of 100 tons secured to the shore in Crater lake. The crater, however, offers very little protection in gales owing to the heavy squalls whirling around it in all directions, and only a few years before the *Eure's* visit the French schooner *Decidée*, moored to the shore inside the northern part of entrance, or jetty as the French term it, parted all her lashings and was dashed against the western shore where she foundered. Afterwards another schooner the *Angèle Elise* narrowly escaped a similar fate.

The *Eure* reported a gradual but very perceptible wasting away of this part of the island.

In November, 1903, H.M.S. *Terpsichore* found four boats, strongly built and in good condition, hauled up on the beach; they had probably been left behind by fishermen from Réunion. The boats were still there in 1910.

Depôt.—The depôt hut built by the *Eure* is of rough stones, with a thatched roof, and stands on the northern side of the crater near

General chart 748a.



(a)

St. Paul island.



(b)

Ninepin rock.

St. Paul island. Entrance to Crater lake.

Plan of St. Paul island on 1921. Var. 26° 50' W.

the jetty and about 50 yards from the flagstaff. It contained 1,323lbs. of preserved beef in 9lb. boxes; 1,102lbs. of biscuit; 10 woollen shirts; 10 blankets; and one soldered metal box containing 4 packets of matches.

The articles were all stored in 13 iron-hooped barrels coated with tar and sand and covered with a tarpaulin. On the door of the hut is the inscription "France, Vivres et Vêtements pour naufragés, Eure, Janvier, 1893." A similar inscription is on a board within the hut.

In November, 1903, when H.M.S. *Terpsichore* visited the island, only 10 casks remained; the hut was in very fair condition, but the roof required repairing. In April, 1910, when the s.s. *Wakefield* visited the island the hut was in the same condition, but only seven full casks remained.

Anchorage (*Lat. 38° 43' S., Long. 77° 32' E.*). — The anchorage is off the eastern side of the island south-eastward of Ninepin rock (*see* view on plan and page 512), where depths of less than 30 fathoms extend 8 cables from the land, but the holding-ground is decidedly bad, being fine black sand over rock, and one only of the vessels engaged in the recovery of the *Megara's* stores escaped loss of anchors and cables. If standing in from the northward with the wind fresh from N.W. or N.N.W., great caution is required in coming-to, for the wind veers to North and N.N.E. off the Ninepin rock, with heavy gusts, which may drive a vessel off the bank before she can be brought up.

North or Middle islets should on no account be shut in behind the Ninepin rock.

Landing.—The passage into Crater lake is sometimes rendered dangerous by the breaking swell, and was observed to be at its worst when light easterly winds prevailed, with a high barometer.

Wind and weather.—Westerly winds prevail throughout the year, varying between N.N.W. and S.S.W.; but during December, January, and February, easterly winds are sometimes experienced.

Gales are frequent during the winter months, June to September, also heavy hailstorms, and snow falls occasionally.

Tides and tidal streams.—It is high water at St. Paul island, full and change, at 11 hours; springs rise 3 feet. The streams often run at 2 or 3 knots over the bar.

Captain Denham draws special attention to the set of the tidal streams, on the eastern side of the island, a knowledge of which might be of the greatest importance, should a vessel be obliged to claw off shore.

At the outer anchorage in 30 fathoms, with Ninepin rock bearing W.N.W., distant 8 cables, the flood stream sets North-west from low

General chart 748a.

Plan of St. Paul island on 1921. Var. 26° 50' W.

water to 2 hours ebb on the shore, or for 8 hours; the ebb stream sets South-east from 2 hours ebb until low water.

At the inner anchorage in 14 fathoms, with Ninepin rock bearing about N.W. by W., distant 3 cables, the flood stream sets in the opposite direction or S.S.E. from low to high water, the ebb stream setting N.N.W. from high to low water. The rate of the streams, at springs, is about one knot.

Plan of Amsterdam island on 1921. Var. 25° 30' W.

AMSTERDAM (Lat. $37^{\circ} 51' S.$, Long. $77^{\circ} 32' E.$), the northernmost island, on which the French flag was also hoisted by the *Bourdonnais* in 1892, followed by a visit from the *Eure* in January, 1893, for the establishment of a dépôt for shipwrecked crews, is an island rising to a height of 2,760 feet and lying North (*true*), about 50 miles from St. Paul island (*see* views on plan). Amsterdam island was discovered by Magellan's companions (Magellan himself having been killed in the Philippine islands on the 27th April, 1521), in the *Victoria*, on the 18th March, 1522, during that vessel's voyage round the world. It was named New Amsterdam by Antonio Van Diemen, who sighted it on the 17th June, 1633, from the Dutch vessel *Nieuw Amsterdam*, when on a voyage from Holland to Java. The Dutch navigator Vlaming anchored off the southern side of the island in the year 1696, and it has been subsequently visited by several eminent navigators.

The island is conveniently situated for correcting the reckoning before approaching the coast of Australia, and, in clear weather, from its great altitude, would be visible from a vessel's deck 50 miles distant, but the strong westerly gales and thick weather so frequently met with near these islands, especially in winter, render caution necessary in approaching them as there are no certain indications of their vicinity, and the seaweed they produce is carried to leeward in small patches. On this island the *Meridian* was wrecked in June, 1853, the passengers and crew to the number of 105 people, after undergoing much suffering, being providentially rescued by the American whaler *Monmouth*.

During the passage of H.M.S. *Pearl* from the Cape of Good Hope to Australia, in 1873, Amsterdam island was partially examined, whilst a running survey was made by Navigating Lieutenant Henry Hosken, who furnished the following account:—

The island was sighted at 4.20 a.m. on the 30th August, at a distance of 12 miles on a S.E. by E. bearing: the West, South, and East sides were then coasted round about a mile distant, no bottom being obtained with the hand lead. Soundings in 120 fathoms and 60 fathoms, black sand, were obtained at about three-quarters of a mile from the eastern side; and also near Hosken point, the north-

General chart 748a.

Plan of Amsterdam island on 1921. Var. 25° 30' W.

eastern extreme of the island, in from 7 to 17 fathoms in a bight formed by a slight indentation of the coast; from Hosken point a reef extends seaward about 3 cables.

The mountains on the western side of the island rise precipitously from the sea cliffs facing the West, and abrupt spurs stretching to the coast to the North-west would render landing on this side of the island, even if possible, useless on account of the impracticability of reaching the interior. D'Entrecasteaux head, the western extreme, is remarkable, having a peaked top and serrated edges. Abreast of this head, the *Pearl* passed through patches of discoloured water, caused either by fragments from the cliffs, or by streams of fresh water that could be seen falling into the sea.

The southern portion of the island has abrupt wall-like cliffs at the water's edge, averaging about 60 feet in height, from which the land rises in a gradual slope to a number of spurs that jut from the high land in the centre of the island; several cones of apparently extinct craters are visible on the spurs. Vlaming head, the South extreme, appears as a steep bluff on a S.E. by E. bearing.

Heavy rollers were observed to break on the western and southern sides of the island, the back-wash extending about 3 cables and giving the appearance of foul ground.

The eastern side of Amsterdam forms a contrast to the western side, the land rising with a gentle slope from the North and South extremes to a mountain, the summit of which appears to be near the centre of the island. From a position eastward, several craters of great height are visible.

On the northern side of the island, in a small indentation westward of Hosken point, between two points in a hollow near a small beach, is a hut in ruins, formerly occupied by fishermen.

No verdure exists on the western side of the island. On the southern side the ground is covered with tufts of long grass. On the north-eastern side, near the coast on the lower ranges are small stunted trees; the grass here is longer and thicker than to the southward, making walking through it difficult.

Pearl anchorage (*Lat. 37° 49' S., Long. 77° 33' E.*).—In the bight, where landing was found, there appeared to be fair temporary anchorage, with winds from N.N.W. round by West to South. With the southern point of the cove bearing S. $\frac{1}{4}$ W. and Hosken point N.W. by N., a vessel is in from 10 to 15 fathoms, fine black sand. The dense patch of kelp extending off, and southward of Hosken point, would probably break the force of a sea from the northward. A depth of 7 fathoms was found amongst the kelp, and from 10 to 17 fathoms at half a cable from it.

General chart 748a.

Plan of Amsterdam island on 1921. Var. 25° 30' W.

Tides.—It is high water, full and change, at Amsterdam island at 11h.; springs rise about 3 feet.

Landing.—A landing-place was found on the north-eastern part of the island, southward of Hosken point, near a landslip or break in the cliff, the swell being broken by patches of kelp. The ship's cutter was anchored in 4 fathoms, and the whale-boat veered astern from her until close to the shore, when no difficulty was found in jumping on the rocks, though this method has been pronounced to be impracticable by other navigators probably owing to differing circumstances of wind and weather. The *Eure* in exceptionally fine weather effected a landing with ease, the boat going alongside a rock in deep water; but, as her captain remarked, "in rough weather it would be a matter of difficulty." This landing-place was marked by a flagstaff placed about 100 yards inshore, but in 1903 the flagstaff was down.

No possible landing-place could be seen along the western, south-western, or south-eastern sides, but on the eastern side, being under the lee, with water tolerably smooth, a boat might approach the shore, and possibly landing might be effected. In May, 1880, landing was safely effected by boat from H.M.S. *Raleigh*, at 1½ miles southward of Hosken point; the ship remained hove-to.

A landing with much difficulty was effected by H.M.S. *Terpsichore*, in November, 1903, on the north coast, under the lee of Recherche point.

Resources.—The ruined hut before mentioned is beyond the ridge about three-quarters of a mile by land from the anchorage. Near here is a cave where apparently the provisions left by the *Eure* are stored. In 1880, a party of ten men from Réunion were here curing fish, and some huts with a flagstaff were then standing near the point. But in 1903 the flagstaff was down and the huts in ruins.

There is an abundant supply of grass for cattle, and in 1903 a number of cattle were seen everywhere, fine animals in good condition, fairly tame and easy to obtain. Rabbits are reported to exist in the south-western part of the island. A number of fine fish of the rock-cod species, weighing from 8 to 35 pounds each, were caught on the bank of soundings near the anchorage; but no seals were observed from the *Pearl*, though early navigators speak of having seen great numbers. Lobsters or crawfish abound near the landing-place.

Water.—There appeared to be abundance of fresh water running down the steep cliffs on the southern part of the island, but probably difficult to obtain.

Depôt.—The depôt of provisions, &c., established by the *Eure*, is in a large cavern in the side of a hill, mentioned on previous page; it lies W. by S. ½ S. distant about 800 yards from Hosken point. At the

General chart 748a.

Plan of Amsterdam island on 1921. Var. 25° 30' W.

entrance to the cavern was a board, fixed to two upright tarred posts, with the inscription "France, Vêtements pour naufragés, Eure, Janvier, 1893."

The dépôt contained 1,323lbs. preserved beef; 1,102lbs. biscuit; 10 woollen shirts; 10 pairs of cotton drawers; 10 blankets; one red soldered metal box containing four packets of matches. There were also in the cavern, some cots, a cooking pot, and dry wood left by fishermen.

In 1903 this dépôt consisted of 8 full barrels, one half empty and one opened and reclosed; they seemed to be in good condition; there were also two empty barrels.

Three wooden iron-bound cases, marked with a red cross, and a tin water-tight case containing matches, were left by the German South Polar exploring vessel *Gauss*, near the landing-place, just above high water, and close to where the flagstaff stood.

Chart 748a.

SLOT VON CAPELLE BANK, the existence of which, as well as its position is considered doubtful, is shown on the chart in lat. 36° 40' S., long. 41° 20' E.; it is named after the Dutch vessel by which it was reported in 1748, which vessel stated it to be of considerable dimensions and obtained soundings in 63 fathoms southward of it. The bank was again seen by the *Automatia* in 1801, and by Captain Vian of the *Jacques-Elizabeth* in 1856.

General chart 748a.

PLACE—MAHE, SEYCHELLES. OBS. Δ LAT. 4° 37' S., LONG. 55° 30' E. Height above M.S.L., 15 feet.

METEOROLOGICAL TABLE COMPILED FROM 14 TO 23 YEARS' OBSERVATIONS.

MONTH.	BAROMETER.* At 32° F. and Mean Sea Level.				AIR TEMPERATURE.								Relative Humidity.		RAIN.			WIND.										No. of Days Gale.	No. of Days Fog.
	Mean.		Absolute.		Mean.				Absolute.				Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale 0 to 10.	Number of Days from												
	For Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.	N.	N.E.	E.	S.E.					S.	S.W.	W.	N.W.	Calm.								
January	Ins. 29-05	0-09	Ins. —	Ins. —	80	83	76	7	87	70	17	84	6	18-11	16	5-60	2	5	2	1	1	0	0	3	15	4	—	—	
February	Ins. 29-05	0-09	Ins. —	Ins. —	81	84	77	7	87	71	16	83	6	17-06	11	6-06	2	4	2	2	2	0	0	2	11	5	—	—	
March	Ins. 29-04	0-09	Ins. —	Ins. —	81	83	77	6	89	69	20	82	6	10-47	15	6-05	2	5	3	2	2	1	0	3	11	4	—	—	
April	Ins. 29-02	0-09	Ins. —	Ins. —	82	85	77	8	89	72	17	80	5	6-39	9	3-55	2	2	2	3	6	2	1	2	7	5	—	—	
May	Ins. 29-05	0-08	Ins. —	Ins. —	81	85	77	8	88	70	18	80	5	5-16	9	3-60	2	0	1	3	17	5	1	0	2	2	—	—	
June	Ins. 29-08	0-08	Ins. —	Ins. —	80	82	76	6	85	68	17	79	6	5-17	11	4-00	3	0	0	1	16	10	1	1	0	1	—	—	
July	Ins. 30-00	0-07	Ins. —	Ins. —	78	82	75	7	84	68	16	78	5	2-44	7	1-55	3	0	0	1	21	7	1	0	0	1	—	—	
August	Ins. 30-00	0-08	Ins. —	Ins. —	78	81	75	6	84	70	14	78	5	2-65	8	2-43	4	0	0	1	21	7	2	0	0	0	—	—	
September	Ins. 30-01	0-09	Ins. —	Ins. —	79	82	75	7	85	68	17	80	5	5-30	8	7-54	3	0	0	2	21	5	1	0	0	1	—	—	
October	Ins. 29-09	0-09	Ins. —	Ins. —	80	83	75	8	86	69	17	80	6	5-06	9	2-80	3	0	1	3	16	6	1	1	1	2	—	—	
November	Ins. 29-08	0-09	Ins. —	Ins. —	80	83	75	8	86	68	18	82	6	10-95	14	5-17	2	1	1	4	8	3	1	2	5	5	—	—	
December	Ins. 29-05	0-08	Ins. —	Ins. —	80	83	76	7	87	69	18	82	6	14-51	16	6-10	2	3	1	1	2	1	1	3	14	5	—	—	
Means	Ins. 29-07	0-09	Ins. —	Ins. —	80	83	76	7	—	—	—	81	6	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	105-27	133	—	—	—	20	13	24	133	47	10	17	66	35	—	
Absolute Values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	7-54	—	—	—	—	—	—	—	—	—	—	—	—	
No. of Years' Observations	14	—	—	—	23	—	—	—	14	—	23	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	14	—	

* Correction for Gravity = 0.08 in. Not applied.

Authorities:—"India Weather Review."

"Indian Meteorological Memoirs," XVII.

Meteorological Office,
June 3rd, 1911.

PLACE—DIEGO GARCIA. OBS. Δ LAT. 7° 23' S., LONG. 72° 28' E.
METEOROLOGICAL TABLE COMPILED FROM ONE YEAR'S OBSERVATIONS.

MONTH.	BAROMETER. At 32° F. and Mean Sea Level.				AIR TEMPERATURE.								RAINF.				WIND.										No. of Days Gale.	No. of Days Fog.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	Mean.		Absolute.		Mean.		Absolute.		Relative Humidity.	Cloud Amount. Scale 0 to 10	Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, 16-hourly Scale.	Number of Days from																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
	For Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.							N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
January -	Ins.	Ins.	Ins.	Ins.	°	°	°	°	%	Ins.	Ins.	—	Ins.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Authority :—Manager of the Atoll.

PLACE—MAHE, SEYCHELLES. OBS. Δ LAT. $4^{\circ} 37' S.$, LONG. $55^{\circ} 30' E.$ Height above *M.S.L.*, 15 feet.

METEOROLOGICAL TABLE COMPILED FROM 14 TO 23 YEARS' OBSERVATIONS.

MONTH.	BAROMETER.* At 32° F. and Mean Sea Level.					AIR TEMPERATURE.							RAIN.				WIND.										No. of Days Gale.	No. of Days Force.	
	Mean.			Absolute.		Mean.			Absolute.				Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from												
	For Month.	Daily Range.	Ins.	Ins.	Max.	Min.	Range.	Max.	Min.	Range.	N.	N.E.					S.E.	S.	S.W.	W.	N.W.	Calm.							
																							°	°	°	°			°
January	29-05	0-09	—	—	—	80	83	76	7	87	70	17	84	6	18-11	16	5-60	2	5	2	1	1	0	0	3	15	4	—	—
February	29-05	0-09	—	—	—	81	84	77	7	87	71	16	83	5	17-06	11	6-96	2	4	2	2	2	0	0	2	11	5	—	—
March	29-04	0-09	—	—	—	81	83	77	6	89	69	20	82	6	10-47	15	6-05	2	5	3	2	2	1	0	3	11	4	—	—
April	29-02	0-09	—	—	—	82	85	77	8	89	72	17	80	5	6-39	9	3-55	2	2	2	3	6	2	1	2	7	5	—	—
May	29-05	0-08	—	—	—	81	85	77	8	88	70	18	80	5	5-16	9	3-60	2	0	1	3	17	5	1	0	2	2	—	—
June	29-08	0-08	—	—	—	80	82	76	6	85	68	17	79	5	5-17	11	4-00	3	0	0	1	16	10	1	1	0	1	—	—
July	30-00	0-07	—	—	—	78	82	75	7	84	68	16	78	5	2-44	7	1-55	3	0	0	1	21	7	1	0	0	1	—	—
August	30-00	0-08	—	—	—	78	81	75	6	84	70	14	78	5	2-65	8	2-43	4	0	0	1	21	7	2	0	0	0	—	—
September	30-01	0-09	—	—	—	79	82	75	7	85	68	17	80	5	5-30	8	7-54	3	0	0	2	21	5	1	0	0	1	—	—
October	29-09	0-09	—	—	—	80	83	75	8	86	69	17	80	6	5-06	9	2-80	3	0	1	3	16	6	1	1	1	2	—	—
November	29-08	0-09	—	—	—	80	83	75	8	86	68	18	82	6	10-95	14	5-17	2	1	1	4	8	3	1	2	5	5	—	—
December	29-05	0-08	—	—	—	80	83	76	7	87	69	18	82	6	14-51	16	6-10	2	3	1	1	2	1	1	3	14	5	—	—
Means	29-07	0-09	—	—	—	80	83	76	7	—	—	—	81	6	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	—	103-27	133	—	—	—	20	13	24	133	47	10	17	66	35	—
Absolute Values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
No. of Years' Observations	14	—	—	—	—	23	—	—	—	—	—	—	—	—	23	—	—	—	—	—	—	—	—	—	—	—	—	14	—

* Correction for Gravity = 0.08 in. Not applied.

Authorities :—"India Weather Review."

"Indian Meteorological Memoirs," XVII.

Meteorological Office,
June 3rd, 1911.

PLACE—DIEGO GARCIA. OBS. Δ LAT. 7° 23' S., LONG. 72° 28' E.
METEOROLOGICAL TABLE COMPILED FROM ONE YEAR'S OBSERVATIONS.

MONTH.	BAROMETER. At 32° F. and Mean Sea Level.				AIR TEMPERATURE.						Relative Humidity.		RAIN.			WIND.										No. of Days Gale.	No. of Days Fog.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	Mean.		Absolute.		Mean.		Range.		Absolute.		Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
	For Month.	Daily Range.	Max.	Min.	Max.	Min.	Max.	Min.	N.	N.E.					E.	S.E.	S.	S.W.	W.	N.W.	Calim.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	Ins.	Ins.	Ins.	Ins.	°	°	°	°	°	°	°	Ins.	°	Ins.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°

Authority :—Manager of the Atoll.

MONTH.	BAROMETER.* At 35° F. and Mean Sea Level.				AIR TEMPERATURE.								Relative Humidity.		RAIN.		WIND.								No. of Days Gale.	No. of Days Fog.																										
	Mean.		Absolute.		Mean.		Absolute.		Range.	Max.	Min.	For Month.	Range.	Max.	Min.	For Month.	Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	N.	N.E.	E.	S.E.			S.	S.W.	W.	N.W.	Calim.																					
	Daily Range.	Mean.	Ins.	Ins.	°	°	°	°																								°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
January	Ins.	30-17	29-33	0-84	80	86	73	13	94	63	31	76	6	7-76	19	0-88	3	2	5	16	5	1	1	0	1	0	1	0	1	0	1	0																				
February	Ins.	30-17	28-91	1-26	80	86	73	13	96	64	32	78	6	6-92	19	17-34	3	1	4	13	6	1	1	1	0	1	1	0	1	0	1	0																				
March	Ins.	30-19	29-03	1-16	79	85	72	13	94	61	33	79	6	8-90	19	7-45	3	1	4	15	8	1	0	1	1	0	1	1	0	1	0	1	0																			
April	Ins.	30-26	27-96	2-30	76	83	70	13	90	58	32	79	6	5-05	18	3-97	3	1	3	15	9	1	1	0	0	0	0	0	0	0	0	0	0																			
May	Ins.	30-31	29-84	0-47	73	80	66	14	89	53	36	77	5	3-56	15	11-24	3	1	2	13	12	1	1	1	0	0	1	1	0	0	0	0	0																			
June	Ins.	30-47	29-89	0-58	70	77	63	14	86	51	35	75	5	2-00	16	2-07	3	0	1	13	14	2	0	0	0	0	0	0	0	0	0	0	0																			
July	Ins.	30-45	29-90	0-55	69	76	62	14	84	51	33	75	5	2-26	19	2-06	3	0	1	16	12	1	1	0	0	0	0	0	0	0	0	0	0																			
August	Ins.	30-43	29-88	0-55	69	76	62	14	85	48	37	74	6	2-31	19	3-76	3	0	1	17	11	1	1	0	0	0	0	0	0	0	0	0	0																			
September	Ins.	30-40	29-90	0-50	70	78	63	15	87	50	37	72	6	1-36	15	1-10	3	0	2	17	10	1	0	0	0	0	0	0	0	0	0	0	0																			
October	Ins.	30-37	29-91	0-46	73	81	65	16	90	50	40	71	6	1-51	14	1-83	3	1	4	17	7	0	0	1	1	0	1	1	0	1	0	1	0																			
November	Ins.	30-30	29-75	0-55	75	84	67	17	93	54	39	70	6	1-88	11	2-89	3	1	5	16	6	1	0	0	1	0	1	0	1	0	1	0	1	0																		
December	Ins.	30-21	28-62	1-29	79	86	71	15	95	60	35	73	6	4-81	17	4-39	3	2	6	16	5	0	0	1	1	0	1	1	0	1	1	0	1	0																		
Means	Ins.	—	—	—	74	81	67	14	—	—	—	—	6	—	—	—	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—																		
Totals	Ins.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—																		
Absolute Values	Ins.	30-47	27-96	2-51	—	—	—	—	—	96	48	48	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—																		
No. of Years' Observations	Ins.	30	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—																		
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* Correction for Gravity = 0.06 in. Not applied.

Authority:—"Results of . . . Meteorological Observations taken at Port Louis, Mauritius."

Meteorological Office,
June 3rd, 1911.

PLACE—PORT MATHURIN, RODRIGUEZ. ORS. Δ LAT. $19^{\circ} 40' S.$, LONG. $63^{\circ} 26' E.$ Height above M.S.L., 10 feet.
METEOROLOGICAL TABLE COMPILED FROM 3 TO 24 YEARS' OBSERVATIONS.

MONTH.	BAROMETER.* At 30° F. and Mean Sea Level.				AIR TEMPERATURE.				Relative Humidity. Scale 0 to 10.		RAIN.		WIND. †										No. of Days Gale.	No. of Days Fog.
	Mean.		Absolute.		Mean.		Absolute.		%	Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from										
	Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.						N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.		
January	Ins.	Ins.	Ins.	Ins.	Ins.	°	°	°	°	Ins.	—	—	—	2	8	12	4	1	1	1	1	—	—	
February	29-08	—	—	—	—	81	°	—	—	6 6-31	—	—	—	2	3	12	7	1	1	1	1	—	—	
March	29-05	—	—	—	—	81	°	—	—	6 5-54	—	—	—	2	3	9	11	3	1	1	1	—	—	
April	29-07	—	—	—	—	81	°	—	—	5 5-84	—	—	—	0	3	14	10	1	0	0	0	—	—	
May	30-02	—	—	—	—	79	°	—	—	5 4-87	—	—	—	1	1	11	13	4	1	0	0	—	—	
June	30-08	—	—	—	—	76	°	—	—	5 3-74	—	—	—	0	1	11	14	3	0	0	0	—	—	
July	30-15	—	—	—	—	73	°	—	—	5 3-90	—	—	—	1	1	10	12	5	0	0	0	—	—	
August	30-20	—	—	—	—	72	°	—	—	5 2-80	—	—	—	0	1	13	14	2	0	0	0	—	—	
September	30-21	—	—	—	—	72	°	—	—	5 3-37	—	—	—	0	2	14	11	2	0	0	0	—	—	
October	30-20	—	—	—	—	73	°	—	—	5 1-75	—	—	—	2	4	13	9	2	1	0	0	—	—	
November	30-15	—	—	—	—	75	°	—	—	5 1-32	—	—	—	1	5	12	8	3	0	1	0	—	—	
December	30-10	—	—	—	—	78	°	—	—	5 2-11	—	—	—	1	8	15	3	2	0	0	0	—	—	
December	30-04	—	—	—	—	80	°	—	—	5 2-92	—	—	—	—	—	—	—	—	—	—	—	—	—	
Means	30-09	—	—	—	—	77	°	—	—	5	—	—	—	—	—	—	—	—	—	—	—	—	—	
Totals	—	—	—	—	—	—	—	—	—	—	44-56	—	—	12	40	146	116	29	5	4	3	—	—	
Absolute Values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
No. of Years' Observations	15	—	—	—	—	24	—	—	—	—	24	—	—	—	—	—	—	—	—	—	—	—	—	

* (Correction for Gravity = 0.06 in. Not applied. † Calms are not recorded. This probably accounts for the deficiency in number of days.

Authorities:—"Annual Reports of the Royal Alfred Observatory, Mauritius."

"Results of . . . Meteorological Observations at Mauritius."

Meteorological Office,
June 3rd, 1911.

PLACE—ST. DENIS, RÉUNION. OBS. Δ LAT. $20^{\circ} 51' S.$, LONG. $55^{\circ} 30' E.$ Height above M.S.L., 101 feet.
METEOROLOGICAL TABLE COMPILED FROM 4 TO 7 YEARS' OBSERVATIONS.

MONTH.	BAROMETER.* At 32° F. and Mean Sea Level.						AIR TEMPERATURE.						Relative Humidity.				RAIN.				WIND										No. of Days Gale.	No. of Days Force.
	Mean.			Absolute.			Mean.			Absolute.			Relative Humidity.				RAIN.				WIND											
	Daily Range.		Ins.	Max.		Min.	Range.		Max.	Min.	Range.		Max.	Min.	Range.		Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from											
	For Month.	Ins.		Ins.	Ins.		Ins.	°			°	°			°	°					°	°	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.		
January	29-04	—	—	—	—	79	88	74	14	—	—	—	76	5	5-06	13	—	—	—	0	1	10	13	3	1	1	1	1	—	—		
February	29-01	—	—	—	—	80	88	75	13	—	—	—	75	5	6-06	11	—	—	—	0	1	7	13	1	1	0	2	3	—	—		
March	29-06	—	—	—	—	80	87	74	13	—	—	—	76	5	5-85	13	—	—	—	0	1	8	13	4	0	1	2	2	—	—		
April	29-09	—	—	—	—	78	86	73	13	—	—	—	79	5	3-12	13	—	—	—	0	0	7	13	3	1	1	1	4	—	—		
May	30-08	—	—	—	—	75	82	70	12	—	—	—	73	4	1-11	9	—	—	—	0	1	7	15	4	1	0	1	2	—	—		
June	30-15	—	—	—	—	71	79	66	13	—	—	—	70	4	0-95	7	—	—	—	1	0	7	15	3	1	1	1	1	—	—		
July	30-19	—	—	—	—	71	78	65	13	—	—	—	68	3	0-68	10	—	—	—	0	0	7	17	4	1	1	0	1	—	—		
August	30-19	—	—	—	—	71	79	65	14	—	—	—	67	4	1-40	9	—	—	—	1	0	5	19	3	1	1	1	0	—	—		
September	30-19	—	—	—	—	72	81	66	15	—	—	—	66	4	0-30	7	—	—	—	0	1	9	16	3	0	1	0	0	—	—		
October	30-12	—	—	—	—	75	83	68	15	—	—	—	68	4	0-39	6	—	—	—	0	1	11	11	2	1	1	2	2	—	—		
November	30-06	—	—	—	—	77	87	71	16	—	—	—	70	4	0-62	8	—	—	—	1	2	8	12	3	0	1	2	1	—	—		
December	30-00	—	—	—	—	79	86	72	14	—	—	—	74	5	5-01	12	—	—	—	1	1	8	12	3	1	1	2	2	—	—		
Means	30-07	—	—	—	—	76	84	70	14	—	—	—	72	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	—	30-55	118	—	—	—	4	9	94	169	36	9	10	15	19	—	—		
Absolute Values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
No. of Years' Observations	6	—	—	—	—	7	4	—	—	—	—	—	—	—	4	—	—	—	—	—	—	—	—	—	—	—	—	—	7	—		

* Correction for Gravity = 0.06 in. Not applied.

Authorities :—"Annales du Bureau Central Météorologique de France."

Buchan's "Challenger" Report.

Meteorological Office,
June 3rd, 1911.

PLACE—PORT DES GALETs, RÉUNION. OBS. Δ LAT. 20° 55' S., LONG. 55° 20' E. Height above M.S.L., 44 feet.
METEOROLOGICAL TABLE COMPILED FROM 3 TO 4 YEARS' OBSERVATIONS.

MONTH.	BAROMETER. At 32° F. and Mean Sea Level.						AIR TEMPERATURE.						Relative Humidity. Scale 0 to 10.		RAIN.			WIND								No. of Days Gale.	No. of Days Fog.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
	Mean.		Absolute.		Range.		Mean.		Absolute.		Range.		Cloud Amount. Scale 0 to 10.	No. of Days.	Total Fall.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	For Month.	Daily Range.	Ins.	Ins.	Min.	Ins.	Max.	Min.	Range.	Max.	Min.	Range.						N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.			Calim.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
January	29-91	—	—	—	—	—	82	90	74	16	94	70	24	71	—	Ins.	—	Ins.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

* Correction for Gravity = 0.06 in. Not applied.

Authority:—"Annales du Bureau Central Météorologique de France."

Meteorological Office.
June 3rd, 1911.

PLACE—FARAFANGANA, MADAGASCAR. OBS. Δ LAT. $22^{\circ} 53'$ S., LONG. $47^{\circ} 56'$ E.
METEOROLOGICAL TABLE COMPILED FROM 3 YEARS' OBSERVATIONS.

MONTH.	BAROMETRIC. At 80° F. and Mean Sea Level.				AIR TEMPERATURE.				Relative Humidity.		RAIN.			WIND.							No. of Days Gale.	No. of Days Fog.								
	Mean.		Absolute.		Mean.		Absolute.		For Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.	N.	N.E.	E.	S.E.			S.	S.W.	W.	N.W.	Calm.			
	For Month.	Ins.	Ins.	Min.	Range.	Max.	Min.	Range.																				Max.	Min.	Range.
January	—	—	—	—	Ins.	Ins.	—	—	81	88	74	14	—	—	—	10.27	16	—	—	—	—	—	—	—	—	—	—			
February	—	—	—	—	—	—	—	—	81	87	75	12	—	—	—	—	14.68	19	—	—	—	—	—	—	—	—	—			
March	—	—	—	—	—	—	—	—	79	84	73	11	—	—	—	—	23.17	22	—	—	—	—	—	—	—	—	—			
April	—	—	—	—	—	—	—	—	77	85	69	16	—	—	—	—	7.79	15	—	—	—	—	—	—	—	—	—			
May	—	—	—	—	—	—	—	—	73	80	65	15	—	—	—	—	9.19	15	—	—	—	—	—	—	—	—	—			
June	—	—	—	—	—	—	—	—	70	77	63	14	—	—	—	—	8.34	14	—	—	—	—	—	—	—	—	—			
July	—	—	—	—	—	—	—	—	68	76	60	16	—	—	—	—	9.35	16	—	—	—	—	—	—	—	—	—			
August	—	—	—	—	—	—	—	—	71	78	63	15	—	—	—	—	8.11	11	—	—	—	—	—	—	—	—	—			
September	—	—	—	—	—	—	—	—	71	78	63	15	—	—	—	—	6.07	16	—	—	—	—	—	—	—	—	—			
October	—	—	—	—	—	—	—	—	75	82	68	14	—	—	—	—	3.62	13	—	—	—	—	—	—	—	—	—			
November	—	—	—	—	—	—	—	—	79	86	71	15	—	—	—	—	6.09	12	—	—	—	—	—	—	—	—	—			
December	—	—	—	—	—	—	—	—	80	87	72	15	—	—	—	—	14.66	18	—	—	—	—	—	—	—	—	—			
Means	—	—	—	—	—	—	—	—	75	82	68	14	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	121.34	187	—	—	—	—	—	—	—	—	—			
Absolute Values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
No. of Years' Observations	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			

Authority :—"Annales du Bureau Central Météorologique de France."

Meteorological Office,
June 3rd, 1911.

PLACE—HELLVILLE, NOSI BE, MADAGASCAR. OBS. Δ LAT. 13° 24' S., LONG. 48° 18' E.
METEOROLOGICAL TABLE COMPILED FROM 3 TO 5 YEARS' OBSERVATIONS.

MONTH.	BAROMETER. At 35° F. and Mean Sea Level.				AIR TEMPERATURE.						Relative Humidity		RAIN.		WIND.										No. of Days Gale.	No. of Days Fog.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	Mean.		Absolute.		Mean.			Absolute.			Cloud Amount. Scale 0 to 10.	Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from								N.			N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	For Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.	Max.	Min.						Range.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
																	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.												Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.	Ins.	Inc.

Authority:—"Annales du Bureau Central Météorologique de France."

Meteorological Office,
June 3rd, 1911.

PLACE—MAJUNGA, MADAGASCAR. OBS. Δ LAT. 15° 44' S., LONG. 46° 20' E. Height above M.S.L., 134 feet.
METEOROLOGICAL TABLE COMPILED FROM 2 TO 3 YEARS' OBSERVATIONS.

MONTH.	BAROMETER. At 32° F. and Mean Sea Level.				AIR TEMPERATURE.						Relative Humidity.		RAIN.			WIND.										No. of Days Gale.	No. of Days Force.
	Mean.		Absolute.		Mean.		Absolute.		Range.	%	Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Number of Days from												
	For Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.							N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.				
January	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	18	4-1	—	8	1	1	1	1	2	2	15	0	1	—			
February	29-86	0-07	—	29-60	—	80	66	73	12	93	60	33	69	—	4	3	2	1	1	1	3	11	2	0	—		
March	29-91	0-07	—	—	—	82	87	75	13	93	68	25	67	—	8	3	2	5	0	3	1	8	1	0	—		
April	29-92	0-06	—	—	—	83	88	74	14	95	70	25	63	—	11	3	15	2-7	—	—	—	—	—	—	—		
May	29-95	0-07	—	—	—	83	91	74	16	95	70	25	57	—	3	3	4	5	2	4	1	7	1	1	—		
June	30-04	0-07	—	—	—	79	89	70	17	92	65	27	51	—	0	3	1	5	—	—	—	—	—	—	—		
July	30-07	0-08	—	—	—	77	87	68	18	92	61	31	46	—	0	0	0	—	—	—	—	—	—	—	—		
August	30-11	0-07	30-26	—	—	76	87	68	19	90	62	28	44	—	0	0	0	—	—	—	—	—	—	—	—		
September	30-10	0-06	—	—	—	77	88	68	20	93	66	30	48	—	0	0	0	—	—	—	—	—	—	—	—		
October	30-07	0-07	—	—	—	79	91	68	21	95	63	32	45	—	0	2	1	5	0	1	4	8	0	0	—		
November	30-02	0-07	—	—	—	81	90	73	17	97	69	28	54	—	3	2	4	1	1	1	5	12	0	0	—		
December	29-99	0-07	—	—	—	82	91	74	16	99	69	30	55	—	2	2	5	2	4	1	1	6	12	0	0	—	
December	29-96	0-07	—	—	—	81	88	73	14	94	70	24	65	—	9	4	11	5	2	2	1	1	14	2	0	—	
Means	30-00	0-07	—	—	—	80	89	71	16	—	—	—	56	—	—	—	—	—	—	—	—	—	—	—	—	—	
Totals	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Absolute Values	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
No. of Years' Observations	3	2	2	2	3	3	2	2	3	3	3	3	2	—	3	3	3	2	—	—	—	—	—	—	—	—	—

Authority :—Stratton C. Knott, Esq., H.M. Vice-Consul, Majunga.

PLACE—KERGUELEN ISLAND. OBS. Δ LAT. 49° 25' S., LONG. 69° 54' E. Height above M.S.L., 51 feet.
METEOROLOGICAL TABLE.

MONTH.	BAROMETER.* At 33° F. and Mean Sea Level.				AIR TEMPERATURE.						RAIN.			WIND.										No. of Days Gale.	No. of Days Fog.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
	Mean.		Absolute.		Mean.		Absolute.		Total Fall.	No. of Days.	Max. Fall in 24 hours.	Mean Force, Beaufort Scale.	Percentage of Observations from																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	For Month.	Daily Range.	Max.	Min.	Range.	Max.	Min.	Range.					N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	Ins.	Ins.	Ins.	Ins.	°	°	°	°	°	Ins.	Ins.	Ins.	°	°	°	°	°	°	°	°	°	°	°			°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°

* Correction for Gravity = 0.01 in. Not applied.

Authority :—" Report on the Meteorology of Kerguelen Island " (Perry).

Meteorological Office,
June 3rd, 1911.

APPENDIX II. CYCLONE TRACKS.

TRACKS of CYCLONES in 1905; laid down at the Royal Alfred Observatory, Mauritius, from Observations received from Ships.

Date, 1905.	Position of Centre at Noon.		Distance travelled in 24 Hours.
	Latitude S.	Longitude E.	
January 21 -	8.9	48.4	Miles. 236
" 22 -	11.5	45.5	236
" 23 -	15.1	43.9	231
" 24 -	19.3	43.4	254
" 25 -	22.2	45.8	221
" 26 -	24.6	49.6	254
" 29 -	14.2	69.2	245
" 21 -	15.4	65.4	229
" 22 -	18.0	62.0	183
" 23 -	20.8	60.7	278
" 24 -	23.3	64.0	
February 22 -	16.7	66.5	192
" 23 -	18.2	64.3	100
" 24 -	20.7	63.8	196
" 25 -	23.8	64.9	
March 18 -	15.7	53.3	259
" 19 -	19.7	51.6	302
" 20 -	24.7	51.6	
" 19 -	15.3	55.5	136
" 20 -	17.3	54.4	158
" 21 -	19.9	54.4	164
" 22 -	22.4	55.6	
" 30 -	13.9	54.1	115
" 31 -	14.4	52.2	130
April 1 -	14.8	50.0	144
" 2 -	15.7	47.7	172
" 3 -	16.9	45.0	163
" 4 -	18.8	43.0	153
" 5 -	21.3	43.3	141
" 6 -	23.2	44.8	163
" 7 -	24.8	47.2	
December 20 -	18.4	53.5	199
" 21 -	21.7	53.7	237
" 22 -	24.9	56.2	

TRACK of the CYCLONE that passed near DIEGO SUAREZ on December 15th, 1904, from Observations received at the Royal Alfred Observatory, Mauritius.

Date, 1904.	Position of Centre at Noon.		Distance travelled in 24 Hours.
	Latitude S.	Longitude E.	
December 10 -	7.7	61.8	Miles. 163
" 11 -	8.2	59.1	147
" 12 -	8.8	56.7	148
" 13 -	9.5	54.3	161
" 14 -	10.3	51.7	164
" 15 -	11.0	49.0	259
" 16 -	12.3	44.8	245
" 17 -	14.0	41.0	113
" 18 -	15.2	39.5	99
" 19 -	16.6	38.6	70
" 20 -	17.7	39.0	72
" 21 -	18.7	39.7	54
" 22 -	19.4	40.3	54
" 23 -	19.9	41.1	63
" 24 -	20.5	42.0	58
" 25 -	21.0	42.9	62
" 26 -	21.6	43.8	64
" 27 -	22.1	44.8	
" 28 -	22.6	45.8	

APPENDIX III.

PARTICULARS OF DRY DOCKS, PATENT SLIPS, &c.

PORT.	Name of Dock.	Length.		Breadth of Entrance.	Depth at H.W.O.S.		Lifting Power.	Date Built.	REMARKS.
		On Blocks.	Over all.		On Sill.	On Blocks.			
Port Victoria..... (Seychelles)	Patent slip	Feet 60 (cradle)	Feet —	Feet —	Feet Forward Aft	Feet 4 7	Tons 50	—	
Port Louis	Stevenson	417	430	50 (on blocks)	19	16 to 14 (inner end)	—	1859	
	Hay	318	324	38 (on blocks)	13½	12	—	1857	
	Patent slip	140 (cradle)	—	—	Forward Aft	6 10	400	—	
Diego Suarez	Government	635	656	82	37½	—	—	—	Building.

APPENDIX IV.

LIST OF PRINCIPAL PORTS, SHOWING
PARTICULARS OF DEPTHS, &c.

Port.	Depth at L.W.O.S. in channel of approach.	Depth at L.W.O.S. in anchorage.	Rise of Tide.	† Remarks.
Diego Suarez Bay (Madagascar)	7 to 8 fathoms..	5 to 10 fathoms	Feet. Sp. $6\frac{1}{2}$ to $8\frac{1}{2}$ Nps. $4\frac{1}{2}$ to $5\frac{1}{2}$	
Port Nievre (Diego Suarez bay)	7 fathoms.....	$4\frac{1}{2}$ to 8 fathoms	„	
Hellville bay (Madagascar)	Eastern, $4\frac{1}{2}$ faths. S.E., 6 to 10 fathoms Western, 13 to 20 fathoms	5 to 10 fathoms	Sp. $11\frac{1}{2}$ Nps. $7\frac{1}{2}$	
Majunga (Madagascar)	4 to 8 fathoms..	4 fathoms	Sp. $12\frac{1}{2}$ Nps. $8\frac{1}{2}$	
Mathurin bay..... (Rodriguez)	Eastern, $4\frac{1}{2}$ faths. Western, 10 faths.	10 fathoms	Sp. 5 Np. $3\frac{1}{2}$	
Port des Galets (Réunion)	27 feet	$26\frac{1}{2}$ feet	Sp. $1\frac{1}{2}$ Nps. $1\frac{1}{2}$	
Port Louis (Mauritius)	5 fathoms	29 feet	Sp. 3 Nps. 2	
Port Victoria (Seychelles)	7 to 12 fathoms	15 to 20 fathoms (Outer) 7 to 10 fathoms (Inner) 9 to 10 fathoms (Outer) 9 to 13 fathoms	Sp. $3\frac{1}{2}$ to 5 Nps. 3	
Tamatave (Madagascar)	Northern, $5\frac{1}{2}$ fathoms Eastern and Southern, 8 fathoms		Sp. 3 Nps. $2\frac{1}{2}$	
Tuléar (Madagascar)	Northern, 8 to 11 fathoms Southern, $3\frac{1}{2}$ fathoms	$4\frac{1}{2}$ fathoms	Sp. $8\frac{1}{2}$ Nps. $5\frac{1}{2}$	
Zaudzi road (Mayotta, Comoro Is.).	N.W., 26 feet .. East, 23 feet	8 to 14 fathoms	Sp. abt. 12	

† Including draught of water allowed when limited by any special regulations.

APPENDIX V.

REGULATIONS FOR ENTERING HARBOURS OF FRENCH POSSESSIONS IN TIME OF WAR.

The following regulations come into operation from the time of the order for mobilisation, and, if necessary, they may be brought into force during a period of political tension.

No vessel other than French men of war may approach the coast within 3 miles, without special permission.

Between sunrise and sunset are to fly their national flag and their number by the International code directly they enter within signalling distance. If they wish to enter the prohibited zone they are to hoist the pilot signal and remain outside the 3-mile limit until signalled to enter by a signal, a signal station, or examination vessel.

From sunset to sunrise vessels approaching are to fly their national flag, and have their navigation lights lit. If they wish to enter the zone they are to burn Bengal lights, blow blasts on the syren, and remain outside of the 3-mile limit until they receive permission to enter from the examination vessel.

Any vessel summoned by the firing of a blank charge is to stop and check her way. If this is disregarded, two minutes later a shot will be fired, and at the expiration of a further two minutes fire will be opened upon her. In cases of urgency the blank charge may be omitted.

At night any vessel approaching within 3 miles is liable to be destroyed forthwith.

In military ports and roadsteads no boats other than those belonging to French men of war are allowed to be under weigh under any circumstances between sunset and sunrise. Between sunrise and sunset boats are allowed to be under weigh when provided with a special permit and under certain restrictions.

In commercial ports the same regulations will hold good, but so arranged as to interfere as little as possible with commercial interests.

All vessels permitted to enter harbour are to take up their allotted anchorage, and may not leave or shift without permission.

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